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(54) Title: METHOD FOR PRODUCING SURFACE TREATED STEEL SHEET, SURFACE TREATED STEEL SHEET AND SURFACE TREATED STEEL SHEET COATED WITH RESIN

(54) 発明の名称: 表面処理鋼板の製造方法、表面処理鋼板、および樹脂被覆表面処理鋼板

(57) Abstract: A method for producing a surface treated steel sheet, which comprises subjecting a steel sheet to dipping or an electrolytic treatment in a surface treating solution which contains one or more of 4-valent vanadium compounds and a pH adjusting agent or such a solution which further contains one or more of a P compound and water-soluble Mo, Ti and Zr compounds, which are positively added; a surface treated steel sheet produced by the method; a surface treated steel sheet having an inorganic or organic coating film formed on the above surface treated steel sheet; and a surface treated steel sheet coated with a resin which has an organic resin layer covering the resultant surface treated steel sheet. These surface treated steel sheets are so excellent in corrosion resistance and in adhesion with an organic resin coating as to replace a surface treated steel sheet treated with a chromate-containing agent.

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(54) ORGANIC MATTER COATED STEEL SHEET EXCELLENT IN CORROSION RESISTANCE AND ITS PRODUCTION METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an organic matter coated steel sheet safe and harmless in production process and in use and further capable of obtaining excellent corrosion resistance.

SOLUTION: The surface of a galvanized steel sheet or an aluminum-plated steel sheet is, as a first layer film, provided with a composite oxide film containing (α) oxide fine grains, (β) phosphoric acid and/or a phosphoric compound and (γ) one or more kinds of metals selected from among Mg, Mn and Al, and the upper part thereof is, as a second layer film, provided with an organic film using an organic high polymer resin (A) containing an OH group and/or a COOH groups as a base resin, and which is incorporated with any rust preventive addition component (B) of one or more kinds of organic compounds selected from among (a) Ca ion exchanged silica and phosphate, (b) Ca ion exchanged silica, phosphate and silicon oxide, (c) a calcium compound and silicon oxide, (d) a calcium compound, phosphate and silicon oxide,

(e) molybdate, (f) triazoles, thiols, thiadiazoles, thiazoles and thiurams.

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CLAIMS

[Claim(s)]

[Claim 1] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, as the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of either of following (a) - (f) in total to this base resin 100 weight section (solid content). (a) calcium ion-exchange silica and a phosphate (b) calcium ion-exchange silica, Phosphate, a silicon oxide (c) lime compound, and a silicon oxide (d) lime compound, The organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose organic compound thickness chosen from phosphate and silicon oxide (e) molybdate (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams is 0.1-5 micrometers.

[Claim 2] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, as the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of following (e), (g), and (h) in total to this base resin 100 weight section (solid content). (e) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat molybdate (g) calcium, lime compound (h) phosphate, and/or whose silicon oxide thickness are 0.1-5 micrometers.

[Claim 3] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, as the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of following following (e) and the rust-proofing addition component (B) of (i) in total to this base resin 100 weight section (solid content). (e) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat whose molybdate (i) calcium ion-exchange silica thickness is 0.1-5 micrometers.

[Claim 4] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, as the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the

case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of following following (f), (g), and (h) in total to this base resin 100 weight section (solid content). (f) Triazoles, thiols, thiadiazole, and thiazoles The organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose organic compound (g) calcium, lime compound (h) phosphate, and/or silicon oxide thickness which are chosen from thiurams are 0.1-5 micrometers.

[Claim 5] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, as the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of following (f) and the rust-proofing addition component (B) of (i) in total to this base resin 100 weight section (solid content). (f) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose (organic compound i) calcium ion-exchange silica thickness chosen from triazoles, thiols, thiadiazole, thiazoles, and thiurams is 0.1-5 micrometers.

[Claim 6] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, as the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of following (e) and the rust-proofing addition component (B) of (f) in total to this base-resin 100 weight section (solid content). (e) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose organic compound thickness chosen from molybdate (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams is 0.1-5 micrometers.

[Claim 7] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, as the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of following (e), (f), (g), and (h) in total to this base resin 100 weight section (solid content). (e) Molybdate (f) triazoles, thiols, and thiadiazole The organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose organic compound (g) calcium, lime compound (h) phosphate, and/or silicon oxide thickness which are chosen from thiazoles and thiurams are 0.1-5 micrometers.

[Claim 8] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, as the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of following (e), (f), and (i) in total to this base resin 100 weight section (solid content).

(e) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose (organic compound i) calcium ion-exchange silica thickness chosen from molybdate (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams is 0.1-5 micrometers.

[Claim 9] The organic covering steel plate the organic coat contained solid lubricant (C) further, and the content of this solid lubricant (C) excelled [steel plate] in the corrosion resistance according to claim 1, 2, 3, 4, 5, 6, 7, or 8 characterized by being 1 - 80 weight section (solid content) to said base resin 100 weight section (solid content).

[Claim 10] The organic covering steel plate excellent in the corrosion resistance according to claim 1, 2, 3, 4, 5, 6, 7, 8, or 9 to which the organic macromolecule resin (A) which has an OH radical and/or a COOH radical is characterized by being thermosetting resin.

[Claim 11] The organic covering steel plate excellent in the corrosion resistance according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 to which the organic macromolecule resin (A) which has an OH radical and/or a COOH radical is characterized by being an epoxy resin and/or a modified epoxy resin.

[Claim 12] The organic covering steel plate excellent in the corrosion resistance according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 characterized by the component (alpha) contained in a multiple oxide coat being silicon oxide.

[Claim 13] The organic covering steel plate excellent in the corrosion resistance according to claim 12 characterized by the diameter of a primary particle of silicon oxide being 8nm or less.

[Claim 14] The organic covering steel plate excellent in corrosion resistance given in claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 characterized by a multiple oxide coat containing organic resin further, or 13.

[Claim 15] A multiple oxide coat A component (alpha), the component (beta) in the amount of P2O5 conversions, and Mg, The sum total coating weight of the component (gamma) in the amount of metal conversions of Mn and aluminum is 6 - 1000 mg/m². An organic coat is the organic covering steel plate excellent in corrosion resistance given in claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13 characterized by coating weight being two or more 0.1 g/m and less than two 0.5 g/m, or 14.

[Claim 16] It is the manufacture approach of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14 or an organic covering steel plate given in 15. On the front face of a zinc system plating steel plate or an aluminum system plating steel plate A (b) oxide particle, (**) -- a phosphoric acid and/or a phosphoric-acid compound, and the metal ion of the Mg (Ha), Mn, or the aluminum -- One sort or two sorts or more which are chosen from the groups which consist of the water-soluble ion containing at least one sort in said metal, a compound containing at least one sort in said metal, and a conjugated compound containing at least one sort in said metal, It contains. The mol concentration of said addition component (b), the sum total mol concentration of 2OP5 conversion of said addition component (b), /(Ha) =0.1-20 and the processing liquid adjusted so that a mole ratio (Ha) / (b) =0.1-1.5 might be satisfied are applied. the sum total mol concentration of the amount conversion of metals of said metal of said addition component (Ha) -- mole-ratio (**) -- The multiple oxide coat whose thickness is 0.005-3 micrometers is formed in a plating steel plate front face by carrying out stoving after an appropriate time. Subsequently The manufacture approach of an organic covering steel plate excellent in the corrosion resistance characterized by forming the organic coat whose thickness is 0.1-5 micrometers by applying and carrying out stoving of the coating constituent for organic coat formation to the upper part.

[Claim 17] The manufacture approach of an organic covering steel plate excellent in the corrosion resistance according to claim 16 characterized by addition component (b) in the processing liquid for multiple oxide coat formation being silicon oxide.

[Claim 18] The manufacture approach of an organic covering steel plate excellent in the corrosion resistance according to claim 16 or 17 to which the processing liquid for multiple oxide coat formation is characterized by containing organic resin further.

[Claim 19] On a plating steel plate front face, a component (alpha), the component (beta) in the amount of P2O5 conversions, and Mg, The sum total coating weight of the component (gamma) in the amount of metal conversions of Mn and aluminum forms the multiple oxide coat of 6 - 1000 mg/m². The manufacture approach of an organic covering steel plate excellent in the corrosion resistance according to claim 16, 17, or 18 characterized by coating weight forming a two or more 0.1 g/m and less than two

0.5 g/m organic coat in the upper part of this multiple oxide coat.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Since it is adapted for environmental problems , such as volatilization , elution , etc. of the effect on the operator and user who deal with a product about the optimal organic covering steel plate for an automobile , household electric appliances , a building materials application , etc. , the cure against waste water treatment at the time of manufacture , and the harmful matter from the product under an operating environment further , this invention relates to the environmental ecad surface treated steel sheet which does not contain heavy metal , such as chromium , lead , cadmium , and mercury , at all in the time of manufacture , and a product .

[0002]

[Description of the Prior Art] From the former, the steel plate with which chromate treatment with the processing liquid which used a chromic acid, dichromic acid, or its salts as the major component was performed is broadly used for the front face of a zinc system plating steel plate or an aluminum system plating steel plate at the steel plate for home electronics, the steel plate for building materials, and the steel plate for automobiles in order to raise corrosion resistance (white-rust-proof, rust-proof nature). This chromate treatment is the economical art which can be performed comparatively easily [excel in corrosion resistance and].

[0003] Although chromate treatment uses the hexavalent chromium which is the public nuisance regulation matter, neither an environment nor the body is substantially polluted by hexavalent chromium from this hexavalent chromium being processed with a closed system in down stream processing, and it being returned and collected completely, and not being emitted to a nature, and chromium elution out of a chromate film being mostly made to zero according to the sealing operation by the organic coat. However, the motion which is going to reduce use of heavy metal including hexavalent chromium independently from the latest global environment problems is increasing. Moreover, when the shredder dust of an abandonment product is abandoned, in order to make it not pollute an environment, or it does not include heavy metal as much as possible in a product, the motion which is going to reduce this has also started.

[0004] Since it is such, in order to prevent generating of the white rust of a zinc system plating steel plate, many pollution-free processing techniques by chromate treatment and so-called chromium free techniques are proposed. Among these, some approaches using an organic system compound or organic resin are also proposed, for example, the following approaches can be mentioned.

[0005] (1) The approach using a tannic acid (for example, JP,51-71233,A)

(2) The approach using the thermosetting coating which mixed the tannic acid with an epoxy resin and amino resin (for example, JP,63-90581,A)

(3) The surface treatment approach which applies the approach (4) hydrazine derivative water solution using the chelate force of tannic acids, such as an approach (for example, JP,8-325760,A) using the mixed constituent of drainage system resin and multiple-valued phenolic acid, to the front face of a tin plate or a galvanized steel plate (for example, JP,53-27694,B, JP,56-10386,B)

(5) The approach using the rust-proofer containing the amine addition salt which was made to add an amine to the mixture of acyl ZARUKOSHIN and a benzothioria SOL, and was obtained (for example, JP,58-130284,A)

(6) The approach using the processing agent which mixed a heterocyclic compound and tannic acids, such as a benzothiazole compound, (for example, JP,57-198267,A)

[0006]

[Problem(s) to be Solved by the Invention] However, there is a trouble which is described below in these conventional techniques. First, each approach of above-mentioned (1) - (4) has a problem in respect of corrosion resistance. This has a cause in the coat obtained having the self-repair effectiveness by neither of the approaches. That is, with a chromate film, it is (a). The barrier effectiveness: The obstruction effectiveness over corrosion factors (water, oxygen, chlorine, etc.) with a trivalent Cr subject's poorly soluble compound (hydration oxide) (b) The self-repair effectiveness: Discover advanced corrosion resistance according to the synergistic effect of both of the protective film formation effectiveness in the corrosion origin by 6 ** Cr. However, with the conventional chromium free technique, even if not depended on chromium about the barrier effectiveness, organic resin etc. could give to some extent, but about the self-repair effectiveness, since the self-repair nature manifestation matter used as an alternative of 6 ** Cr was not offered, advanced corrosion resistance was unrealizable.

[0007] Moreover, the corrosion resistance of the approach of the above (1) is not only inadequate, but the uniform appearance after processing is not acquired. Moreover, it is not a thing with an eye on especially the approach of the above (2) forming a thin film-like (0.1-5 micrometers) rust-proofing coat in a zinc system or an aluminum system plating front face directly, and even if it applies to a zinc system or an aluminum system plating front face in the shape of a thin film for this reason, sufficient corrosion prevention effectiveness is not acquired. Moreover, corrosion resistance is inadequate similarly about the approach of the above (3).

[0008] The approach of the above (4) is not what was applied about the zinc system or the aluminum system plating steel plate, and even if it applies to a zinc system or an aluminum system plating steel plate, since the coat obtained does not have the network structure, it will not have sufficient barrier nature, and its corrosion resistance will be still more inadequate for this reason. Moreover, although mixing water soluble polymer compounds (polyvinyl alcohol, a maleate copolymer, acrylic ester copolymer, etc.) in a hydrazine derivative water solution with an eye on the homogeneous improvement in a coat is indicated by JP,53-23772,B and JP,56-10386,B, corrosion resistance sufficient with the mere mixture of a hydrazine derivative water solution and a water soluble polymer compound is not acquired.

[0009] Furthermore, the corrosion resistance which was not a thing with an eye on the approach of of the above (5) and (6) also forming a rust-proofing coat in a zinc system or an aluminum system plating steel plate front face for a short time, and was excellent since there was no barrier nature to corrosion factors, such as oxygen and water, even if it applied the processing agent to the plating steel plate front face is not acquired. Moreover, although mixing with resin (an epoxy resin, acrylic resin, urethane resin, nitrocellulose resin, vinyl chloride resin, etc.) is also described as an additive about the approach of (6), corrosion resistance sufficient with the mere mixture of heterocyclic compounds, such as a benzothiazole compound, and resin is not acquired.

[0010] Moreover, in order to remove the oil applied to the front face by press working of sheet metal etc., each approach of above-mentioned (1) - (6) is set on practical use conditions which perform with a pH [by a spray etc.] of about nine to 11 alkaline degreasing, and a coat is exfoliated or damaged with alkaline degreasing, and it has the problem that corrosion resistance cannot be held. Therefore, these approaches are not what was suitable for practical use as an approach of forming a rust-proofing coat. Moreover, digitization progresses and, as for the latest OA equipment and the latest AV equipment, severe conductivity has come to be required from a surface treated steel sheet from the cure against a noise. Moreover, spot welding is performed like the assembler of a chassis in many cases, and OA equipment requires the advanced continuation RBI nature in spot welding, in order to secure high productivity. Since the corrosion resistance excellent in the very thin coat is shown in the case of the

organic covering steel plate which has a chromate film, it can respond also to the demand of such severe conductivity or the advanced continuation RBI nature in spot welding, but in the conventional chromium free-lancer's organic covering steel plate, it becomes easy to generate the corrosion from the defective part of a coat, and there is a problem that corrosion resistance falls remarkably by this, so that it becomes a thin film.

[0011] Therefore, the purpose of this invention solves the technical problem of such a conventional technique, and is to offer the organic covering steel plate with which insurance and the corrosion resistance which was harmless and was moreover excellent are acquired excluding heavy metal, such as hexavalent chromium, in a coat also in case it is used, a production process and. Moreover, other purposes of this invention are to offer the organic covering steel plate which has advanced conductivity and spot welding nature with the above outstanding corrosion resistance.

[0012]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, as a result of this invention persons' inquiring wholeheartedly, a specific multiple oxide coat is formed in the front face of a zinc system plating steel plate or an aluminum system plating steel plate as the 1st layer coat. In the upper part as the 2nd layer coat By using specific organic macromolecule resin as base resin, and forming the organic coat which carried out optimum dose combination of the specific self-repair nature manifestation matter (rust-proofing addition component) which replaces hexavalent chromium into this basic resin Without performing chromate treatment with a possibility of having a bad influence on an environment or the body, it was pollution-free and found out that the organic covering steel plate which was extremely excellent in corrosion resistance was obtained. Furthermore, it found out that the organic covering steel plate which has advanced conductivity and spot welding nature with the outstanding corrosion resistance was obtained by regulating the coating weight of the 1st layer coat of such an organic covering steel plate, and the 2nd layer coat in the specific range.

[0013] The configuration by which this invention was made based on such knowledge, and it is characterized [the] is as follows.

On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, [1] As the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of either of following (a) - (f) in total to this base resin 100 weight section (solid content). (a) calcium ion-exchange silica and a phosphate (b) calcium ion-exchange silica, Phosphate, a silicon oxide (c) lime compound, and a silicon oxide (d) lime compound, The organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose organic compound thickness chosen from phosphate and silicon oxide (e) molybdate (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams is 0.1-5 micrometers.

[0014] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, [2] As the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of following (e), (g), and (h) in total to this base resin 100 weight section (solid content). (e) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat molybdate (g) calcium, lime compound (h) phosphate, and/or whose silicon oxide thickness are 0.1-5 micrometers.

[0015] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate,

[3] As the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of following following (e) and the rust-proofing addition component (B) of (i) in total to this base resin 100 weight section (solid content). (e) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat whose molybdate (i) calcium ion-exchange silica thickness is 0.1-5 micrometers.

[0016] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, [4] As the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of following following (f), (g), and (h) in total to this base resin 100 weight section (solid content). (f) Triazoles, thiols, thiadiazole, and thiazoles The organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose organic compound (g) calcium, lime compound (h) phosphate, and/or silicon oxide thickness which are chosen from thiurams are 0.1-5 micrometers.

[0017] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, [5] As the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of following (f) and the rust-proofing addition component (B) of (i) in total to this base resin 100 weight section (solid content). (f) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose (organic compound i) calcium ion-exchange silica thickness chosen from triazoles, thiols, thiadiazole, thiazoles, and thiurams is 0.1-5 micrometers.

[0018] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, [6] As the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of following (e) and the rust-proofing addition component (B) of (f) in total to this base resin 100 weight section (solid content). (e) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose organic compound thickness chosen from molybdate (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams is 0.1-5 micrometers.

[0019] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, [7] As the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of following (e), (f), (g), and (h) in total to this base resin 100 weight section (solid content). (e)

Molybdate (f) triazoles, thiols, and thiadiazole The organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose organic compound (g) calcium, lime compound (h) phosphate, and/or silicon oxide thickness which are chosen from thiazoles and thiurams are 0.1-5 micrometers.

[0020] On the front face of a zinc system plating steel plate or an aluminum system plating steel plate, [8] As the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg (gamma), Mn, and aluminum (however, the case where it is contained as a compound and/or a conjugated compound is included), (alpha) It has the multiple oxide coat whose thickness to contain is 0.005-3 micrometers. In the upper part as the 2nd layer coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. Carry out 1-100 weight section (solid content) content of the rust-proofing addition component (B) of following (e), (f), and (i) in total to this base resin 100 weight section (solid content). (e) Organic covering steel plate excellent in the corrosion resistance characterized by having the organic coat one or more sorts of whose (organic compound i) calcium ion-exchange silica thickness chosen from molybdate (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams is 0.1-5 micrometers.

[0021] [9] The above [1] Organic covering steel plate the organic coat contained solid lubricant (C) further, and the content of this solid lubricant (C) excelled [steel plate] in the corrosion resistance characterized by being 1 - 80 weight section (solid content) to said base resin 100 weight section (solid content) in one organic covering steel plate of - [8].

[10] The above [1] Organic covering steel plate excellent in the corrosion resistance to which the organic macromolecule resin (A) which has an OH radical and/or a COOH radical is characterized by being thermosetting resin in one organic covering steel plate of - [9].

[11] The above [1] Organic covering steel plate excellent in the corrosion resistance to which the organic macromolecule resin (A) which has an OH radical and/or a COOH radical is characterized by being an epoxy resin and/or a modified epoxy resin in one organic covering steel plate of - [10].

[0022] [12] The above [1] Organic covering steel plate excellent in the corrosion resistance characterized by the component (alpha) contained in a multiple oxide coat being silicon oxide in one organic covering steel plate of - [11].

[13] The organic covering steel plate which was excellent in the corrosion resistance characterized by the diameter of a primary particle of silicon oxide being 8nm or less in the organic covering steel plate of the above [12].

[14] The above [1] Organic covering steel plate excellent in the corrosion resistance characterized by a multiple oxide coat containing organic resin further in one organic covering steel plate of - [13].

[15] The above [1] It is the organic covering steel plate which was excellent in the corrosion resistance to which the sum total coating weight of a component (alpha), the component (beta) in the amount of P2O5 conversions, and the component (gamma) in the amount of metal conversions of Mg, Mn, and aluminum of a multiple oxide coat is 6 - 1000 mg/m², and an organic coat is characterized by coating weight being two or more 0.1 g/m and less than two 0.5 g/m in one organic covering steel plate of - [14].

[0023] [16] The above [1] It is the manufacture approach of one organic covering steel plate of - [15]. On the front face of a zinc system plating steel plate or an aluminum system plating steel plate (b) oxide particle, (**) -- a phosphoric acid and/or a phosphoric-acid compound, and the metal ion of the Mg (Ha), Mn, or the aluminum -- One sort or two sorts or more which are chosen from the groups which consist of the water-soluble ion containing at least one sort in said metal, a compound containing at least one sort in said metal, and a conjugated compound containing at least one sort in said metal, It contains. The mol concentration of said addition component (b), the sum total mol concentration of 2OP5 conversion of said addition component (b), /(Ha) = 0.1-20 and the processing liquid adjusted so that a mole ratio (Ha) / (b) = 0.1-1.5 might be satisfied are applied. the sum total mol concentration of the amount conversion of metals of said metal of said addition component (Ha) -- mole-ratio (**) -- The multiple oxide coat whose thickness is 0.005-3 micrometers is formed in a plating steel plate front face by carrying out stoving after an appropriate time. Subsequently The manufacture approach of an organic

covering steel plate excellent in the corrosion resistance characterized by forming the organic coat whose thickness is 0.1-5 micrometers by applying and carrying out stoving of the coating constituent for organic coat formation to the upper part.

[0024] [17] The manufacture approach of an organic covering steel plate of having excelled in the corrosion resistance characterized by addition component (b) in the processing liquid for multiple oxide coat formation being silicon oxide in the manufacture approach of the above [16].

[18] The manufacture approach of an organic covering steel plate excellent in the corrosion resistance to which the processing liquid for multiple oxide coat formation is characterized by containing organic resin further in the above [16] or the manufacture approach of [17].

[19] The above [16] In one manufacture approach of - [18] on a plating steel plate front face The sum total coating weight of a component (alpha), the component (beta) in the amount of P2O5 conversions, and the component (gamma) in the amount of metal conversions of Mg, Mn, and aluminum forms the multiple oxide coat of 6 - 1000 mg/m². The manufacture approach of an organic covering steel plate excellent in the corrosion resistance characterized by coating weight forming a two or more 0.1 g/m and less than two 0.5 g/m organic coat in the upper part of this multiple oxide coat.

[0025] The fundamental description of the organic covering steel plate of this invention on the front face of a zinc system plating steel plate or an aluminum system plating steel plate as the 1st layer coat An oxide particle, a phosphoric acid (beta) and/or a phosphoric-acid compound, and Mg (gamma), (alpha) One or more sorts of metals (however, the case where it is contained as a compound and/or a conjugated compound is included) chosen from Mn and aluminum are contained (preferably). The multiple oxide coat contained as a principal component is formed. In the upper part further as the 2nd layer coat Epoxy resin and/or modified epoxy resin) is used as base resin still more preferably. the organic macromolecule resin (A) which has an OH radical and/or a COOH radical -- (-- desirable -- thermosetting resin -- as self-repair nature manifestation matter (rust-proofing addition component) to this (a) calcium ion-exchange silica and phosphate, (b) calcium ion-exchange silica, Phosphate and silicon oxide, the (c) lime compound, and silicon oxide, (d) A lime compound, phosphate and silicon oxide, (e) molybdate, (f) Triazoles, thiols, thiadiazole, and thiazoles one or more sorts of organic compounds chosen from thiurams, and ** -- inner either -- or it is in the point in which the organic coat which blended with the above (e) and/or (f) the rust-proofing addition component (B) which carried out compound addition of other components was formed.

[0026] Although the corrosion prevention device by the bilayer coat structure which consists of such a specific multiple oxide coat and a specific organic coat is not necessarily clear, when the barrier operation by coat formation resin of corrosion depressor effect and the 2nd layer coat which is stated to the following depended on the multiple oxide coat of the 1st layer coat compound-izes, though it is a thin film, it is thought that the corrosion resistance which is equal to a chromate film is acquired.

[0027] although it is not necessarily clear about the corrosion prevention device of the multiple oxide coat which is the above-mentioned 1st layer coat -- ** -- a precise poorly soluble multiple oxide coat intercepts a corrosion factor as barrier sex skin film -- ** Oxide particles, such as silicon oxide, form stable and precise barrier layer anodic oxide coating with a phosphoric acid and/or a phosphoric-acid compound, and one or more sorts of metals chosen from Mg, Mn, and aluminum, ** When an oxide particle is silicon oxide, silicate ion stimulates formation of basic-salt-ized zinc under corrosive environment, and is considered that the anti-corrosiveness which was excellent by raising barrier nature etc. is obtained.

[0028] When a defect furthermore arises in a coat, OH ion generates and an interface becomes alkalinity by the cathode reaction, the above-mentioned component (gamma) precipitates as Me (OH)₂, blocks a defect as a precise poorly soluble product, and is considered to control corrosion reaction. Moreover, as mentioned above, while contributing a phosphoric acid and/or a phosphoric-acid compound to improvement in the compactness of a multiple oxide coat, a phosphoric-acid component catches the zinc ion which dissolved by the anode reaction which is corrosion reaction in a coat defective part, and it is thought that a precipitate product is formed there as a poorly soluble phosphoric-acid zinc compound. As mentioned above, it is thought that a component (gamma), a phosphoric acid, and/or a phosphoric-

acid compound show the self-remedial action in a coat defective part.

[0029] Moreover, the corrosion resistance which was excellent also in the above-mentioned component (gamma) especially when a magnesium component was contained is acquired. This is considered that the solubility of Mg of a hydroxide is low compared with other metals, and it is for being easy to form a refractory salt. Moreover, the above operation effectiveness is acquired in SiO₂ particle as a component (alpha) of a multiple oxide coat especially notably [are specific coating weight, and / are specific coating weight about a phosphoric acid and/or a phosphoric-acid compound, and / as a component (gamma) / when it is specific coating weight about a magnesium component and is made to contain, respectively] as a component (beta), as mentioned above.

[0030] Although it is not necessarily clear about the corrosion prevention device of the organic coat which is the above-mentioned 2nd layer coat the organic macromolecule resin (A) (desirable -- thermosetting resin --) which has an OH radical and/or a COOH radical An epoxy resin and/or a modified epoxy resin form precise barrier layer anodic oxide coating by the reaction with a cross linking agent still more preferably. This barrier layer anodic oxide coating Since it excels in the transparency control ability of corrosion factors, such as oxygen, and firm bonding strength with a base is acquired by the OH radical and COOH radical in a molecule, it is thought that the especially excellent corrosion resistance (barrier nature) is acquired.

[0031] In the organic covering steel plate of this invention, moreover, in the organic coat which consists of the above specific organic macromolecule resin (a) calcium ion-exchange silica and a phosphate (b) calcium ion-exchange silica, Phosphate, a silicon oxide (c) lime compound, and a silicon oxide (d) lime compound, Phosphate and silicon oxide (e) molybdate (f) triazoles Either of one or more sorts of organic compounds chosen from thiols, thiadiazole, thiazoles, and thiurams, Or the anti-corrosiveness (the self-repair effectiveness) which was especially excellent in the above (e) and/or (f) by carrying out optimum dose combination of the rust-proofing addition component (B) which carried out compound addition of other components, and the (self-repair nature manifestation matter) can be obtained. The corrosion prevention device acquired by having blended the component of above-mentioned (a) - (f) into this specific organic coat is considered as follows.

[0032] First, the component of above-mentioned (a) - (d) discovers self-repair nature according to a precipitate operation, and is considered that the reaction mechanism progresses at the following steps.

[The 1st step]: **** calcium carries out the priority dissolution under corrosive environment rather than zinc and aluminum which are a plating metal.

[The 2nd step]: In the case of phosphate, the calcium ion to which the calcium ion which carried out the priority dissolution at the phosphoric-acid ion dissociated by the hydrolysis reaction and the 1st step of the above carried out the priority dissolution of the complexation reaction at the 1st step of the above on the front face in the case of a lifting and silicon oxide adsorbs, and carry out electric neutralization of the surface charge, and condense it. Consequently, in any case, a precise and poorly soluble protective film generates, and corrosion reaction is controlled when this blocks a corrosion origin.

[0033] Moreover, the component of the above (e) discovers self-repair nature according to the passivation effectiveness. That is, a precise oxide is formed in a plating coat front face with dissolved oxygen under corrosive environment, and corrosion reaction is controlled when this blocks a corrosion origin. Moreover, the component of the above (f) discovers self-repair nature according to an adsorption effect. That is, it sticks to the polar group in which the zinc eluted by corrosion and aluminum contain the nitrogen which the component of the above (f) has, and sulfur, and an inactive coat is formed, and corrosion reaction is controlled when this blocks a corrosion origin.

[0034] Although a certain amount of corrosion prevention effectiveness is acquired even when the component of above-mentioned (a) - (f) is blended into a general organic coat By having blended the self-repair nature manifestation matter of above-mentioned (a) - (f) into the organic coat excellent in the barrier property which consists of specific organic giant-molecule resin like this invention, both effectiveness (barrier property and self-repair nature) compound-izes, and is considered that the corrosion prevention effectiveness which was extremely excellent by this is demonstrated. moreover, considering the self-repair effectiveness acquired by each component of above-mentioned (a) - (d), (e),

and (f) For obtaining more advanced self-repair nature, the above (e) and/or (f) are used as an indispensable component. It is desirable to adjust the rust-proofing addition component (B) of the following combination which compounded other components with this (combination), and the self-repair nature (namely, white-rust-proof) especially, most advanced when it is following (6) and (7) is obtained.

[0035] (1) (e) molybdate, (g) calcium, and/or a lime compound, And rust-proofing addition component which blended (h) phosphate and/or silicon oxide (2) (e) molybdate, And rust-proofing addition component which blended (i) calcium ion-exchange silica (3) (f) triazoles One or more sorts of organic compounds chosen from thiols, thiadiazole, thiazoles, and thiurams, (g) Calcium and/or a lime compound and (h) phosphate, and/or silicon oxide, Blended rust-proofing addition component (4) One or more sorts of organic compounds chosen from (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams, and rust-proofing addition component which blended (i) calcium ion-exchange silica [0036] (5) (e) molybdate and (f) triazoles, thiols, One or more sorts of organic compounds chosen from thiadiazole, thiazoles, and thiurams, Blended rust-proofing addition component (6) (e) molybdate and (f) triazoles One or more sorts of organic compounds chosen from thiols, thiadiazole, thiazoles, and thiurams, (g) Calcium and/or a lime compound and (h) phosphate, and/or silicon oxide, Blended rust-proofing addition component (7) One or more sorts of organic compounds chosen from (e) molybdate, (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams, and rust-proofing addition component which blended (i) calcium ion-exchange silica [0037] Moreover, since the organic covering steel plate of this invention has advanced corrosion resistance according to a device which was described above, On making it fully decrease and a concrete target, the coating weight of these coats The component (alpha), the component (beta) in the amount of P2O5 conversions, and Mg of the 1st layer coat, The sum total coating weight of the component (gamma) in the amount of metal conversions of Mn and aluminum 6-1000mg, Coating weight of the 2nd layer coat can be made into two or more 0.1 g/m and less than two 0.5 g/m, and it can consider as the organic covering steel plate which has advanced conductivity and spot welding nature with the corrosion resistance which was excellent with this.

[0038]

[Embodiment of the Invention] Hereafter, the detail and its reason for limitation of this invention are explained. As a zinc system plating steel plate used as the base of the organic covering steel plate of this invention A galvanized steel sheet, a Zn-nickel alloy-plating steel plate, a Zn-Fe alloy-plating steel plate (an electroplating steel plate and alloying hot-dip zinc-coated carbon steel sheet), A Zn-Cr alloy-plating steel plate, a Zn-Mn alloy-plating steel plate, a Zn-Co alloy-plating steel plate, A Zn-Co-Cr alloy-plating steel plate, a Zn-Cr-nickel alloy-plating steel plate, A Zn-Cr-Fe alloy-plating steel plate, a Zn-aluminum alloy-plating steel plate For example, (a Zn-5%aluminum alloy-plating steel plate, a Zn-55%aluminum alloy-plating steel plate), A Zn-Mg alloy-plating steel plate, a Zn-aluminum-Mg plating steel plate, the zinc system composite-coatings steel plate (for example, Zn-SiO2 distribution plating steel plate) that distributed the metallic oxide, the polymer, etc. in the plating coat of these plating steel plates can be used further.

[0039] Moreover, the double layer plating steel plate which galvanized congener or a thing of a different kind more than two-layer among the above plating can also be used. Moreover, as an aluminum system plating steel plate used as the base of the organic covering steel plate of this invention, an aluminum plating steel plate, an aluminum-Si alloy-plating steel plate, etc. can be used. Moreover, as a plating steel plate, plating with half-closed eyes, such as nickel, may be beforehand performed to a steel plate side, and the various above plating may be performed on it. As the plating approach, which approach among an electrolytic decomposition process (electrolysis in a water solution or electrolysis in a non-aqueous solvent), scorification, and gaseous-phase methods which can be enforced is also employable.

[0040] Moreover, since it is made for neither a coat defect nor nonuniformity to arise when a bilayer coat which is mentioned later is formed in a plating coat front face, alkaline degreasing, solvent degreasing, surface control processing (alkaline surface control processing, acid surface control processing), etc. can be beforehand processed on a plating coat front face if needed. Moreover, surface control processing by the acidity or the alkaline water solution which contains an iron-group metal ion

(nickel ion, Co ion, Fe ion) on a plating coat front face beforehand if needed can also be performed in order to prevent the black discoloration (a kind of the oxidation phenomenon on the front face of plating) under the operating environment of an organic covering steel plate. Moreover, when using an electrolytic zinc-coated carbon steel sheet as a substrate steel plate, an iron-group metal ion (nickel ion, Co ion, Fe ion) can be added to an electroplating bath in order to prevent black discoloration, and 1 ppm or more of these metals can be made to contain in a plating coat. In this case, there is especially no limit about the upper limit of the iron-group metal concentration in a plating coat.

[0041] Next, the multiple oxide coat which is the 1st layer coat formed in the front face of a zinc system plating steel plate or an aluminum system plating steel plate is explained. The alkali silicate processing coats represented by the coat constituent which consists of conventional lithium oxide and silicon oxide completely differ, and this multiple oxide coat is an oxide (alpha) particle (preferably). It is a multiple oxide (it contains as principal component preferably) coat containing silicon oxide, a phosphoric acid (beta) and/or a phosphoric-acid compound, and one or more sorts of metals (however, the case where it is contained as a compound and/or a conjugated compound is included) chosen from Mg (gamma), Mn, and aluminum.

[0042] Especially as an oxide particle which is said component (alpha), silicon oxide (SiO₂ particle) is desirable from a corrosion resistance viewpoint. Moreover, colloidal silica is the most desirable also in silicon oxide. As colloidal silica, for example The Snow tex O by Nissan Chemical Industries, Ltd. The Snow tex OS, the Snow tex OXS, the Snow tex OUP, The Snow tex AK, the Snow tex O40, the Snow tex OL The Snow tex OL 40, the Snow tex OZL, the Snow tex XS, The Snow tex S, the Snow tex NXS, the Snow tex NS, the Snow tex N Snow tex QAS-25 and a catalyst -- formation -- KATAROIDOS made from Industry -- KATAROIDO SI-350, KATAROIDO SI-40, KATAROIDO SA KATAROIDO SN and the Asahi Denka Kogyo K.K. make -- ADERAITO AT-20-50, ADERAITO AT-20N, ADERAITO AT-300, ADERAITO AT-300S, ADERAITOAT20Q, etc. can be used.

[0043] Also in these silicon oxide, especially particle diameter is desirable from a thing 14nm or less and a still more desirable viewpoint of corrosion resistance [thing / 8nm or less]. Moreover, as silicon oxide, the thing which made the coat constituent solution distribute a dry type silica particle can also be used. As this dry type silica, for example, Aerosil 200 made from Japanese Aerosil, Aerosil 3000, Aerosil 300CF, Aerosil 380, etc. can be used, and a thing 7nm or less is still more preferably desirable the particle diameter of 12nm or less especially.

[0044] As an oxide particle, the colloidal solutions, such as an aluminum oxide, a zirconium dioxide, titanium oxide, cerium oxide, and antimony oxide, impalpable powder, etc. can also be used besides the above-mentioned silicon oxide. the coating weight with the viewpoint of corrosion resistance and weldability to the above-mentioned desirable component (alpha) -- 0.01 - 3000 mg/m² -- more -- desirable -- 0.1 - 1000 mg/m² -- it is 1 - 500 mg/m² still more preferably. Moreover, the coating weight with the desirable above-mentioned component (alpha) from a viewpoint of obtaining corrosion resistance, advanced conductivity, and spot welding nature to coincidence is 1 - 600 mg/m².

[0045] The phosphoric acid and/or phosphoric-acid compound which are said component (beta) can be blended as a coat component by adding one sort, such as these metal salts, compounds, etc., such as orthophosphoric acid, a pyrophosphoric acid, polyphosphoric acid, and a metaphosphoric acid, or two sorts or more in a coat constituent. Moreover, one or more sorts of organic phosphorus acids or those salts (for example, phytic acid, a phytic acid salt, phosphonic acid, phosphonate, and these metal salts) may be added to a coat constituent. Moreover, the first phosphate is suitable from the field of the stability of a coat constituent solution also in it. Moreover, when one or more sorts of the monobasic ammonium phosphate, dibasic calcium phosphate, and the third ammonium phosphate were added in the coat constituent solution as phosphate, the inclination for corrosion resistance to be improved more was accepted. Although the reason is not clear, when such ammonium salt is used, even if it makes pH of a coat constituent solution high, liquid does not gel. Generally, in an alkali region, since a metal salt serves as insolubility, when a coat is formed from a coat constituent solution with high pH, it is thought that a more poorly soluble compound arises in a desiccation process.

[0046] There is no limitation also with a special phosphoric-acid [in the inside of a coat] and

phosphoric-acid compound's existence gestalt, and it does not ask [a crystal or] whether it is amorphous. Moreover, there is no constraint special also about the phosphoric acid in the inside of a coat, the ionicity of a phosphoric-acid compound, and solubility. the coating weight with viewpoints, such as corrosion resistance and weldability, to the above-mentioned desirable component (beta) -- the amount conversion of P_2O_5 -- 0.01 - 3000 mg/m² -- more -- desirable -- 0.1 - 1000 mg/m² -- it is 1 - 500 mg/m² still more preferably. Moreover, the coating weight with the desirable above-mentioned component (beta) from a viewpoint of obtaining corrosion resistance, advanced conductivity, and spot welding nature to coincidence is 1 - 600 mg/m².

[0047] It is said component (gamma). Especially the gestalt to which one or more sorts of metals chosen from Mg, Mn, and aluminum exist in a coat is not limited, but may exist as a metal as a compound or conjugated compounds, such as an oxide, a hydroxide, a hydration oxide, a phosphoric-acid compound, and a coordination compound. It is not limited about the ionicity of these compounds, a hydroxide, a hydration oxide, a phosphoric-acid compound, a coordination compound, etc., and especially solubility, either. Each above-mentioned element which is a component (gamma) forms a phosphoric acid, a phosphoric-acid compound, and an oxide particle and a conjugated compound in a coat, forms the precise barrier sex skin film, and contributes it to corrosion-resistant improvement.

[0048] Among these elements, OH ion generates by the cathode reaction under corrosive environment, an interface becomes alkalinity, Mg blocks the defect of a coat by precipitating as precise poorly soluble Mg (OH)₂, and it is thought that corrosion reaction is controlled. OH ion generates by the cathode reaction under corrosive environment, an interface becomes alkalinity, and Mn blocks the defect of a coat by precipitating as poorly soluble precise phosphate or a precise poorly soluble hydroxide, and is considered to control corrosion reaction. Moreover, since it is hard to dissolve the phosphate of Mn under an alkali environment when alkaline degreasing washes the processing oil on the front face of a steel plate, slushing oil, volatile oil, etc. by the user, it is very suitable. OH ion generates by the cathode reaction under corrosive environment, an interface becomes alkalinity, and aluminum blocks the defect of a coat by precipitating as precise poorly soluble phosphate, and is considered to control corrosion reaction. Moreover, since it is hard to dissolve the phosphate of aluminum under an alkali environment when alkaline degreasing washes the processing oil on the front face of a steel plate, slushing oil, volatile oil, etc. by the user, it is very suitable.

[0049] What is necessary is just to add to a coat constituent as the phosphate of Mg, Mn, and aluminum, a sulfate, a nitrate, a chloride, etc. as an approach of introducing a component (gamma) into a coat. the coating weight with the viewpoint of fall prevention of corrosion resistance and a coat appearance to the above-mentioned desirable component (gamma) -- the amount conversion of metals -- 0.01 - 1000 mg/m² -- more -- desirable -- 0.1 - 500 mg/m² -- there are 1-100mg[m] 2 still more preferably. Moreover, the coating weight with the desirable above-mentioned component (gamma) from a viewpoint of obtaining corrosion resistance, advanced conductivity, and spot welding nature to coincidence is 1 - 600 mg/m².

[0050] It is desirable 0.1-20, and that mole-ratio (alpha)/(gamma) (however, a component (gamma) the amount of metal conversions of said metal) of the oxide (alpha) particle which is the constituent of a multiple oxide coat, and one or more sorts of metals (however, the case where it is contained as a compound and/or a conjugated compound is included) chosen from Mg (gamma), Mn, and aluminum sets to 0.1-10 desirably. If this mole-ratio (alpha)/(gamma) is not fully obtained less than by 0.1 but the addition effectiveness of an oxide particle exceeds 20 on the other hand, an oxide particle will check the eburnation of a coat. Moreover, as for mole-ratio (gamma)/(beta) (however, a component (beta) a component (gamma) $2OP_5$ conversion, the amount conversion of metals of said metal) of the phosphoric acid (beta) and/or phosphoric-acid compound which are the constituent of a multiple oxide coat, and one or more sorts of metals (however, the case where it is contained as a compound and/or a conjugated compound is included) chosen from Mg (gamma), Mn, and aluminum, being referred to as 0.1-1.5 is desirable. Since the poor solubility of a multiple oxide coat is spoiled for this mole ratio with the phosphoric acid of fusibility less than by 0.1 and corrosion resistance falls, it is not desirable. Moreover, since processing liquid ammonia quality will fall remarkably if a mole ratio exceeds 1.5; it is

not desirable.

[0051] Into a multiple oxide coat, organic resin can be further blended for the purpose of raising the workability of a coat, and corrosion resistance. As this organic resin, one sort, such as an epoxy resin, urethane resin, acrylic resin, an acrylic-ethylene copolymer, an acrylic-styrene copolymer, alkyd resin, polyester resin, and ethylene resin, or two sorts or more can be used. These can be introduced into a coat as water soluble resin and/or water-dispersion resin. Furthermore, it is effective to use together a water-soluble epoxy resin, water-soluble phenol resin, water-soluble butadiene rubber (SBR, NBR, MBR), melamine resin, block isocyanate, an oxazoline compound, etc. as a cross linking agent in addition to these drainage system resin.

[0052] In a multiple oxide coat, as an additive for raising corrosion resistance further furthermore, a polyphosphate and phosphate (for example, phosphoric-acid zinc and phosphoric-acid 2 hydrogen aluminum --) Molybdate, such as phosphorous acid zinc, molybdophosphate A (molybdophosphoric acid aluminum etc. and organic phosphorus) acid and its salt [for example,] for example, phytic acid, a phytic acid salt, phosphonic acid, phosphonate, and these metal salts -- An alkali-metal salt etc. may blend one sort, such as organic inhibitor (for example, a hydrazine derivative, thiol compounds, dithiocarbamate, etc.) and organic compounds (for example, polyethylene glycol etc.), or two sorts or more.

[0053] furthermore -- as other additives -- an organic color pigment (for example, a condensed multi-ring system organic pigment --) coloring colors (for example, organic solvent fusibility azo dye --), such as a phthalocyanine system organic pigment Inorganic pigments, such as a water-soluble azo metal color (for example, titanium oxide etc.), chelating agents (for example, thiol etc.) and a conductive pigment (for example, zinc --) Metal powder, such as aluminum and nickel, Lynn-ized iron, antimony doping mold tin oxide, etc. can also add one sort, such as coupling agents (for example, a silane coupling agent, a titanium coupling agent, etc.) and a melamine cyanuric acid addition product, or two sorts or more.

[0054] Moreover, in a multiple oxide coat, one or more sorts of an iron-group metal ion (nickel ion, Co ion, Fe ion) may be added in order to prevent the black discoloration (a kind of the oxidation phenomenon on the front face of plating) under the operating environment of an organic covering steel plate. Addition of nickel ion is the most desirable especially. In this case, desired effectiveness will be acquired if there are or more [10000] 1/M as concentration of an iron-group metal ion to component (gamma) 1M (metal conversion) in the amount conversion of metals in a processing constituent. Although especially the upper limit of iron-group ion concentration is not defined, it is desirable to consider as extent which does not affect corrosion resistance with the increment in concentration, and it is desirable 1M and to consider as about 1/100M desirably to component (gamma) 1M (metal conversion).

[0055] The thickness of a multiple oxide coat sets more preferably 0.01-2-micrometer 0.005-3 micrometers [0.1-1-micrometer] to 0.2-0.5 micrometers still more preferably. Corrosion resistance falls [the thickness of a multiple oxide coat] by less than 0.005 micrometers. On the other hand, if thickness exceeds 3 micrometers, conductivity, such as weldability, will fall. moreover, the sum total coating weight which includes the amount of P2O5 conversions of the above-mentioned component (alpha) and the above-mentioned component (beta), and the amount of metal conversions of the above-mentioned component (gamma) when the coating weight prescribes a multiple oxide coat -- 6 - 3600 mg/m2 -- desirable -- 10 - 1000 mg/m2 -- further -- desirable -- 50 - 500 mg/m2 -- it is especially preferably appropriate 100 - 500 mg/m2 and to consider as 200 - 400 mg/m2 most preferably. Corrosion resistance falls [this sum total coating weight] less than [6mg //m] by two, and on the other hand, if sum total coating weight exceeds 3600 mg/m2, since conductivity falls, weldability etc. will fall. Moreover, it is appropriate 6 - 1000 mg/m2 and to make preferably sum total coating weight of the above (gamma) in the amount of metal conversions of the above-mentioned component (alpha), the above-mentioned component (beta) in the amount of P2O5 conversions, and Mg, Mn and aluminum into 10 - 600 mg/m2 to obtain advanced conductivity and spot welding nature with corrosion resistance. This sum total coating weight has the insufficient corrosion resistance of less than two 6 mg/m, and on the other hand, if sum total coating weight exceeds 1000 mg/m2, the very advanced conductivity and spot welding

nature which are considered as a request will not be obtained.

[0056] Next, the organic coat formed in the upper part of the above-mentioned multiple oxide coat as the 2nd layer coat is explained. In this invention, the organic coat formed in the upper part of a multiple oxide coat The organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used as base resin. The rust-proofing addition component of either of following (a) - (f) which is the self-repair nature manifestation matter at this (B), (a) calcium ion-exchange silica and a phosphate (b) calcium ion-exchange silica, Phosphate, a silicon oxide (c) lime compound, and a silicon oxide (d) lime compound, Phosphate and silicon oxide (e) molybdate (f) triazoles The rust-proofing addition component (B) which carried out compound addition of other components is blended with one or more sorts of organic compounds chosen from thiols, thiadiazole, thiazoles, and thiurams or the above (e), and/or (f). Furthermore, the thickness with which solid lubricant (C) was blended if needed is the organic coat which is 0.1-5 micrometers.

[0057] As base resin of an organic coat, the organic macromolecule resin (A) which has an OH radical and/or a COOH radical is used. Moreover, in it, thermosetting resin is desirable and especially an epoxy resin or a modified epoxy resin is desirable. The thermosetting epoxy resin and thermosetting modified epoxy resin which have the cutoff nature which was furthermore excellent to corrosion factors, such as oxygen, also in it are the optimal, and it is advantageous especially when making coating weight of a coat into a low, in order to obtain especially advanced conductivity and spot welding nature. As organic macromolecule resin which has an OH radical and/or a COOH radical, two or more sorts of mixture or addition polymerization objects of an epoxy resin, polyhydroxy polyether resin, the acrylic copolymer resin, the ethylene-acrylic-acid copolymer resin, an alkyd resin, a polybutadiene resin, phenol resin, polyurethane resin, polyamine resin, polyphenylene resin, and these resin etc. are mentioned, for example.

[0058] (1) the epoxy resin which added propylene oxide, ethyleneoxide, or a polyalkylene glycol to the epoxy resin and bisphenol A which glycidyl-ether-ized bisphenol A, Bisphenol F, the novolak, etc. as an epoxy resin epoxy resin, and was glycidyl-ether-ized -- an aliphatic series epoxy resin, an alicycle group epoxy resin, a polyether system epoxy resin, etc. can be used further. Especially these epoxy resins have a with a number average molecular weight of 1500 or more desirable thing, when it needs hardening at low temperature. In addition, the above-mentioned epoxy resin can also mix and use independent or a different thing of a class.

[0059] As a modified epoxy resin, the resin which made various modifiers react to the epoxy group or BIDOROKISHIRU radical in the above-mentioned epoxy resin is mentioned. For example, the amine addition urethane modified epoxy resin which added alkanolamine to the epoxy acrylate resin which denaturalized with the epoxy ester resin to which the carboxyl group in a drying-oil fatty acid was made to react, the acrylic acid, the methacrylic acid, etc., the urethane modified epoxy resin to which the isocyanate compound was made to react, and the urethane modified epoxy resin which made the isocyanate compound react to an epoxy resin can be mentioned. The above-mentioned polyhydroxy polyether resin is a polymer which is made to carry out the polycondensation of the dihydric phenol of a single karyotype or two karyotypes, or the mixed dihydric phenol of a single karyotype and two karyotypes to the epihalohydrin of an equimolecular amount mostly under existence of an alkali catalyst, and is obtained. Resorcinol, hydroquinone, and a catechol are mentioned as an example of representation of single karyotype dihydric phenol, bisphenol A is mentioned as an example of representation of 2 karyotype phenol, and these may be used independently or may use two or more sorts together.

[0060] (2) As urethane resin urethane resin, oil denaturation polyurethane resin, alkyd system polyurethane resin, polyester system polyurethane resin, polyether system urethane resin, polycarbonate system polyurethane resin, etc. can be mentioned, for example.

(3) alkyd resin alkyd resin -- carrying out -- for example, oil modified alkyd resin, rosin modified alkyd resin, phenol modified alkyd resin, styrene alkyd resin, silicon modified alkyd resin, acrylic modified alkyd resin, oil free alkyd resin, the amount oil of macromolecules free alkyd resin, etc. can be mentioned.

[0061] (4) As acrylic resin acrylic resin, polyacrylic acid and its copolymer, polyacrylic ester and its copolymer, polymethacrylic acid ester and its copolymer, polymethacrylic acid ester and its copolymer, an urethane-acrylic-acid copolymer (or urethane denaturation acrylic resin), a styrene-acrylic-acid copolymer, etc. are mentioned, and the resin which denatured these resin with other alkyd resin, an epoxy resin, phenol resin, etc. further may be used, for example.

[0062] (5) Ethylene resin (polyolefin resin)

As ethylene resin, ethylene system copolymers, such as an ethylene-acrylic-acid copolymer, an ethylene-methacrylic-acid copolymer, and carboxyl denaturation polyolefin resin, an ethylene-unsaturated-carboxylic-acid copolymer, an ethylene system ionomer, etc. are mentioned, and the resin which denatured these resin with other alkyd resin, an epoxy resin, phenol resin, etc. may be used further, for example.

(6) As acrylic silicon resin acrylic silicon resin, what added the curing agent at this is mentioned to the side chain or end of an acrylic copolymer including a hydrolysis nature alkoxy silyl radical as base resin, for example. The outstanding weatherability can be expected when these acrylic silicon resin is used.

[0063] (7) As a fluororesin fluororesin, there is a fluoro olefin system copolymer and there is a copolymer to which copolymerization of alkyl vinyl ether, synchro alkyl vinyl ether, carboxylic-acid denaturation vinyl ester, the hydroxyalkyl allyl compound ether, tetrafluoro propyl vinyl ether, etc. and the fluorine monomer (fluoro olefin) was carried out as a monomer in this. When these fluororesins are used, the outstanding weatherability and the outstanding hydrophobicity can be expected.

[0064] Moreover, the core shell mold water-dispersion resin which consists of resin of a resin class which is different in the core part and shell part of a resin particle with an eye on low-temperature-izing of the drying temperature of resin, or a different glass transition temperature can be used. Moreover, the bridge formation between particles which used generation of the silanol group by hydrolysis of alkoxysilane and the dehydration condensation reaction of the silanol group between resin particles at the time of stoving of resin can be used by giving an alkoxysilane radical to a resin particle, using the water-dispersion resin which has self-cross-linking. Moreover, the organic compound silicate which made organic resin compound-ize with a silica through a silane coupling agent as resin used for an organic coat is also suitable.

[0065] It is desirable to use especially thermosetting resin in this invention with an eye on improvement in the corrosion resistance of an organic coat or workability. In this case, curing agents, such as amino resin, such as urea-resins (butyl-ized urea-resin etc.), melamine resin (butylated melamine resin), a butyl-ized urea and melamine resin, and benzoguanamine resin, block isocyanate, an oxazoline compound, and phenol resin, can be blended. In the organic resin described above, if corrosion resistance, workability, and paintwork are taken into consideration, an epoxy resin and ethylene resin are desirable and especially the thermosetting epoxy resin and thermosetting modified epoxy resin that have the cutoff nature which was excellent to corrosion factors, such as an enzyme, especially are suitable. As these thermosetting resin, an addition product or a condensate of a thermosetting epoxy resin, a thermosetting modified epoxy resin, an epoxy group content monomer and the copolymerized acrylic copolymer resin, the polybutadiene resin that has an epoxy group, the polyurethane resin which has an epoxy group, and these resin etc. can be mentioned, it is independent, or two or more sorts can be mixed and one sort of these epoxy group content resin can be used.

[0066] The rust-proofing addition component of either of following (a) - (f) which is the self-repair nature manifestation matter in an organic coat in this invention (B), (a) calcium ion-exchange silica and a phosphate (b) calcium ion-exchange silica, Phosphate, a silicon oxide (c) lime compound, and a silicon oxide (d) lime compound, The rust-proofing addition component (B) which blended other components with one or more sorts of organic compounds chosen from phosphate and silicon oxide (e) molybdate (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams or the above (e), and/or (f) is added. These components (a) It is as having described the corrosion prevention device by - (f) previously.

[0067] The above-mentioned component (a) and calcium ion-exchange silica contained in (b) are what fixed calcium ion to the front face of porosity silica gel powder, and calcium ion is emitted under corrosive environment and it forms precipitation membrane. Although the thing of arbitration can be

used as a calcium ion-exchange silica, the thing 4 micrometers or less of mean particle diameter is desirably desirable, for example, it can use 6 micrometers or less of things whose mean particle diameter is 2-4 micrometers. If the mean particle diameter of calcium ion-exchange silica exceeds 6 micrometers, while corrosion resistance will fall, the distributed stability in the inside of a coating constituent falls. As for calcium concentration in calcium ion-exchange silica, it is desirable more than 1wt% and that it is 2 - 8wt% desirably. Less than [1wt%], the rust-proofing effectiveness according [calcium concentration] to calcium emission is not fully acquired. In addition, it is not limited about the surface area of calcium ion-exchange silica, pH, and especially oil absorption.

[0068] As above calcium ion-exchange silicas It is SHIELDEX C303 (the mean particle diameter of 2.5-3.5 micrometers) made from W.R.Grace&Co. at a trade name. calcium concentration 3wt%, SHIELDEX AC3 (the mean particle diameter of 2.3-3.1 micrometers) calcium concentration 6wt%, SHIELDEX AC5 (the mean particle diameter of 3.8-5.2 micrometers) SHIELDEX made from Fuji SHIRISHIA Chemistry (mean-particle-diameter [of 3 micrometers], calcium concentration 6 - 8wt%), SHIELDEX SY710 (mean-particle-diameter [of 2.2-2.5 micrometers], calcium concentration 6.6 - 7.5wt%), etc. can be used calcium concentration 6wt%.

[0069] The phosphate contained in the above-mentioned component (a), (b), and (d) contains the salt of all classes, such as simple salt and double salt. Moreover, limitation may not be in the metal cation which constitutes it, and which metal cations, such as phosphoric-acid zinc, magnesium phosphate, calcium phosphate, and aluminium phosphate, are sufficient. Moreover, there is no limitation in whenever [frame / of phosphoric-acid ion /, or condensation] etc., any of normal salt, 2 hydrogen salt, 1 hydrogen salt, or phosphite are sufficient, and normal salt contains all condensed phosphates, such as a polyphosphate besides an orthophosphate, further.

[0070] Any of a calcium oxide, a calcium hydroxide, and a calcium salt are sufficient as the above-mentioned component (c) and the lime compound contained in (d), and these one sort or two sorts or more can be used for it. Moreover, a peach is good using the double salt containing cations other than calcium, such as calcium phosphate and zinc besides the simple salt which especially a limit does not have in the class of calcium salt, either, and contains only calcium as cations, such as a calcium silicate, a calcium carbonate, and calcium phosphate, and calcium phosphate magnesium, and calcium.

[0071] Any of colloidal silica and a dry type silica are sufficient as the silicon oxide contained in the above-mentioned component (b), (c), and (d). As colloidal silica, in using drainage system coat formation resin as the base By the trade name, for example, the Snow tex O by Nissan Chemical Industries, Ltd., Snow tex N The Snow tex 20, the Snow tex 30, the Snow tex 40, the Snow tex C the Snow tex S and a catalyst -- formation -- Industry -- KATAROIDOS of make, KATAROIDO SI-350, KATAROIDO SI-40, and KATAROIDO SA -- KATAROIDO SN, ADERAITO AT-20-50 by Asahi Denka Kogyo K.K., ADERAITO AT-20N, ADERAITO AT-300, ADERAITO AT-300S, ADERAITOAT20Q, etc. can be used.

[0072] moreover, in using solvent system coat formation resin as the base By the trade name, for example, ORGANO silica sol MA-ST-M by Nissan Chemical Industries, Ltd., ORGANO silica sol IPA-ST, ORGANO silica sol EG-ST, ORGANO silica sol E-ST-ZL, ORGANO silica sol NPC-ST, ORGANO silica sol DMAC-ST, ORGANO silica sol DMAC-ST-ZL, ORGANO silica sol XBA-ST, ORGANO silica sol MIBK-ST, a catalyst -- formation -- Industry -- OSCAL-1132 of make, OSCAL-1232, and OSCAL- 1332, OSCAL-1432, OSCAL-1532, OSCAL-1632, OSCAL-1722, etc. can be used.

[0073] Especially an organic solvent distributed silica sol is excellent in dispersibility, and excels fumed silica in corrosion resistance. Moreover, as fumed silica, AEROSIL R971, AEROSIL R812, AEROSIL R811, AEROSIL R974, AEROSIL R202, AEROSILR805 and AEROSIL130 made from Japanese Aerosil, AEROSIL 200, AEROSIL300, AEROSIL 300CF, etc. can be used by the trade name, for example.

[0074] It is thought that a particle silica can control promotion of corrosion by contributing to generation of the corrosion product of precise and stable zinc under corrosive environment, and forming this corrosion product in a plating front face precisely. As for a particle silica, from a corrosion resistance viewpoint, it is desirable that particle diameter uses desirably 5-50nm of 5-20nm of 5-15nm things still

more preferably. Limitation does not have molybdate of said component (e) in whenever [frame and condensation], for example, alt.molybdate, paramolybdate, metamolybdate, etc. are mentioned. Moreover, as double salt, phosphoric-acid molybdate etc. is mentioned including all salts, such as simple salt and double salt.

[0075] As triazoles, among the organic compounds of the above-mentioned component (f) 1, 2, 4-triazole, 3-amino-1,2,4-triazole, 3-mercapto - 1, 2, 4-triazole, 5-amino-3-mercapto - 1, 2, 4-triazole, 1H-benzotriazol, etc. again as thiols 1,3,5-triazine-2,4,6-trithiol, 2-mercapto Benz imidazole, etc. again as thiadiazole 5-amino-2-mercapto - 1, 3, 4-thiadiazole, 2,5-dimercapto-1,3,4-thiadiazole, etc. again as thiazoles 2-N and N-diethylthio benzothiazole and 2-mercaptobenzothiazole are mentioned for a tetraethylthiuram disulfide etc. as thiurams again, respectively.

[0076] the above-mentioned component (a) -- setting -- the compounding ratio of calcium ion-exchange silica (a1) and phosphate (a2) -- the weight ratio of solid content -- $(a1) / (a2) = 1 / 99 - 99/1$ -- desirable -- $10 / 90 - 90/10$ -- $20 / 80 - 80/20$ are still more preferably suitable. Less than by $1/99$, $(a1)/(a2)$ has few calcium elution volumes, and cannot form only the protective film which blocks a corrosion origin. On the other hand, if $99/1$ is exceeded, since phosphoric-acid ion required for formation of a protective film to start the calcium and complexation reaction for the calcium of the amount beyond the need to not only be eluted, but will not be supplied enough, corrosion resistance will fall on the contrary.

[0077] In the above-mentioned component (b) $20 / 80 - 80/20$ are still more preferably suitable. the compounding ratio of calcium ion-exchange silica (b1), phosphate (b2), and silicon oxide (b3) -- the weight ratio of solid content -- $(b1) / (b2) + (b3) = 1 / 99 - 99/1$ -- desirable -- $10 / 90 - 90/10$ -- $20 / 80 - 80/20$ are still more preferably suitable. [moreover (b2),] Less than (b2) $1/99$ and $(b3)$ have few calcium elution volumes and amounts of phosphoric-acid ion less than $1/99$, and $(b1) / (b2) + (b3)$ cannot form only the protective film which blocks a corrosion origin. When $(b1) / (b2) + (b3)$ exceeds $99/1$, on the other hand, the calcium of the amount beyond the need is not only eluted for formation of a protective film, but Silicon oxide required for making phosphoric-acid ion and calcium required starting the calcium and complexation reaction adsorb is not fully supplied. Moreover, silicon oxide required for making the calcium eluted when $(b2)/(b3)$ exceeded $99/1$ adsorb is not fully supplied, but also when it is any, corrosion resistance will fall on the contrary.

[0078] the above-mentioned component (c) -- setting -- the compounding ratio of a lime compound (c1) and silicon oxide (c2) -- the weight ratio of solid content -- $(c1) / (c2) = 1 - 99 - 99 / 1$ -- desirable -- $10 / 90 - 90/10$ -- $20 / 80 - 80/20$ are still more preferably suitable. Less than by $1/99$, $(c1)/(c2)$ has few calcium elution volumes, and cannot form only the protective film which blocks a corrosion origin. On the other hand, if $99/1$ is exceeded, since silicon oxide required for making the calcium the calcium of the amount beyond the need not only being to elute, but adsorb for formation of a protective film will not fully be supplied, corrosion resistance will fall on the contrary.

[0079] In the above-mentioned component (d) $20 / 80 - 80/20$ are still more preferably suitable. the compounding ratio of a lime compound (d1), phosphate (d2), and silicon oxide (d3) -- the weight ratio of solid content -- $(d1) / (d2) + (d3) = 1 / 99 - 99/1$ -- desirable -- $10 / 90 - 90/10$ -- $(d2) / (d3) = 1 / 99 - 99/1$ -- desirable -- $10 / 90 - 90/10$ -- $20 / 80 - 80/20$ are still more preferably suitable. Less than (d2) $1/99$ and $(d3)$ have few calcium elution volumes and amounts of phosphoric-acid ion less than $1/99$, and $(d1) / (d2) + (d3)$ cannot form only the protective film which blocks a corrosion origin. When $(d1) / (d2) + (d3)$ exceeds $99/1$, on the other hand, the calcium of the amount beyond the need is not only eluted for formation of a protective film, but Silicon oxide required for making phosphoric-acid ion and calcium required starting the calcium and complexation reaction adsorb is not fully supplied. Moreover, silicon oxide required for making the calcium eluted when $(d2)/(d3)$ exceeded $99/1$ adsorb is not fully supplied, but also when it is any, corrosion resistance will fall on the contrary.

[0080] Above-mentioned rust-proofing addition component (a) - (f) forms a protective film in the bottom of corrosive environment, respectively according to the precipitate effectiveness (component (a) in the case of - (d)), the passivation effectiveness (in the case of a component (e)), and an adsorption effect (in the case of a component (f)), as stated previously. In this invention, the corrosion prevention effectiveness which was extremely excellent in especially specific organic macromolecule resin when

the self-repair effectiveness by the barrier effectiveness by specific organic macromolecule resin and above-mentioned (component a) above-mentioned component (a) - (f) compound-ized by blending either of - (f) is demonstrated.

[0081] moreover, considering the self-repair effectiveness (the protective film formation effectiveness of three types mentioned above) acquired by each component of above-mentioned (a) - (d), (e), and (f) It is desirable to adjust the rust-proofing addition component (B) of the following combination which carried out compound addition of other components in obtaining more advanced self-repair nature at the above (e) and/or (f) (combination), and the self-repair nature (namely, white-rust-proof) especially, most advanced when it is following (6) and (7) is obtained.

(1) Rust-proofing addition component which blended (e) molybdate, (g) calcium and/or a lime compound and (h) phosphate, and/or silicon oxide (2) (e) molybdate and rust-proofing addition component which blended (i) calcium ion-exchange silica [0082] (3) (f) triazoles, thiols, thiadiazole, and thiazoles One or more sorts of the organic compounds, (g) calcium, and/or the lime compounds which are chosen from thiurams, And rust-proofing addition component which blended (h) phosphate and/or silicon oxide (4) (f) triazoles One or more sorts of organic compounds chosen from thiols, thiadiazole, thiazoles, and thiurams, And rust-proofing addition component which blended (i) calcium ion-exchange silica (5) Rust-proofing addition component which blended one or more sorts of organic compounds chosen from (e) molybdate and (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams [0083] (6) (e) molybdate, (f) triazoles, thiols, One or more sorts of organic compounds chosen from thiadiazole, thiazoles, and thiurams, (g) Calcium and/or a lime compound and (h) phosphate, and/or silicon oxide, Blended rust-proofing addition component (7) (e) molybdate and (f) triazoles one or more sorts of organic compounds chosen from thiols, thiadiazole, thiazoles, and thiurams, and the rust-proofing addition component which blended (i) calcium ion-exchange silica -- here About the lime compound which can be applied, phosphate, silicon oxide, and calcium ion-exchange silica, it is the same as that of what was previously described about the component of (a) - (d).

[0084] In the rust-proofing addition component which blended (e) molybdate, (g) calcium and/or the lime compound and (h) phosphate, and/or silicon oxide of the above (1) 20 / 80 - 80/20 are still more preferably suitable. the compounding ratio of these (e), (g), and (h) -- the weight ratio of solid content -- $(e)/(g)+(h) = 1 / 99 - 99/1$ -- desirable -- 10 / 90 - 90/10 -- $(g)/(h) = 1 / 99 - 99/1$ -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable. [moreover,]

[0085] Here, the effectiveness by $(e)/(g)+(h)$ compounding less than 1/99 and then different self-repair effectiveness by exceeding 99/1 is not fully acquired. Moreover, if $(g)/(h)$ has few calcium elution volumes, and cannot form only the protective film which blocks a corrosion origin less than by 1/99 but 99/1 is exceeded on the other hand Since silicon oxide required for making phosphoric-acid ion and calcium required starting the calcium and complexation reaction the calcium of the amount beyond the need not only being eluted, but adsorb for formation of a protective film is not fully supplied, sufficient self-repair effectiveness is not acquired.

[0086] the rust-proofing addition component which blended (e) molybdate of the above (2), and (i) calcium ion-exchange silica -- setting -- the compounding ratio of (e) and (i) -- the weight ratio of solid content -- $(e)/(i) = 1 / 99 - 99/1$ -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable. Here, the effectiveness by $(e)/(i)$ compounding less than 1/99 and then different self-repair effectiveness by exceeding 99/1 is not fully acquired.

[0087] (f) triazoles of the above (3), thiols, and thiadiazole In the rust-proofing addition component which blended one or more sorts chosen from thiazoles and thiurams of an organic compound, (g) calcium and/or lime compounds and (h) phosphate, and/or silicon oxide 20 / 80 - 80/20 are still more preferably suitable. the compounding ratio of these (f), (g), and (h) -- the weight ratio of solid content -- $(f)/(g)+(h) = 1 / 99 - 99/1$ -- desirable -- 10 / 90 - 90/10 -- $(g)/(h) = 1 / 99 - 99/1$ -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable. [moreover,]

[0088] Here, the effectiveness by $(f)/(g)+(h)$ compounding less than 1/99 and then different self-repair effectiveness by exceeding 99/1 is not fully acquired. Moreover, if $(g)/(h)$ has few calcium elution volumes, and cannot form only the protective film which blocks a corrosion origin less than by 1/99 but

99/1 is exceeded on the other hand Since silicon oxide required for making phosphoric-acid ion and calcium required starting the calcium and complexation reaction the calcium of the amount beyond the need not only being eluted, but adsorb for formation of a protective film is not fully supplied, sufficient self-repair effectiveness is not acquired.

[0089] In the rust-proofing addition component which blended one or more sorts of organic compounds chosen from (f) triazoles of the above (4), thiols, thiadiazole, thiazoles, and thiurams, and (i) calcium ion-exchange silica (f) -- and the compounding ratio of (i) -- the weight ratio of solid content -- (f)/(i) = 1 / 99 - 99/1 -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable. Here, the effectiveness by (f)/(i) compounding less than 1/99 and then different self-repair effectiveness by exceeding 99/1 is not fully acquired.

[0090] In the rust-proofing addition component which blended one or more sorts of organic compounds chosen from (e) molybdate of the above (5) and (f) triazoles, thiols, thiadiazole, thiazoles, and thiurams (e) -- and the compounding ratio of (f) -- the weight ratio of solid content -- (e)/(f) = 1 / 99 - 99/1 -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable. Here, the effectiveness by (e)/(f) compounding less than 1/99 and then different self-repair effectiveness by exceeding 99/1 is not fully acquired.

[0091] (e) molybdate of the above (6), (f) triazoles, thiols, In the rust-proofing addition component which blended one or more sorts chosen from thiadiazole, thiazoles, and thiurams of an organic compound, (g) calcium and/or lime compounds and (h) phosphate, and/or silicon oxide 20 / 80 - 80/20 are still more preferably suitable. the compounding ratio of these (e), (f), (g), and (h) -- the weight ratio of solid content -- (e)/(f) = 1 / 99 - 99/1 -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable. (e) -- /(g)+(h) = 1 / 99 - 99/1 -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable. (f) -- /(g)+(h) = 1 / 99 - 99/1 -- desirable -- 10 / 90 - 90/10 -- (g) -- /(h) = 1 / 99 - 99/1 -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable.

[0092] Here, the effectiveness by (e)/(f) and (e)/(g)+ (h) and (f)/(g)+ (h) compounding less than 1/99 and then different self-repair effectiveness by exceeding 99/1, respectively is not fully acquired. Moreover, if (g)/(h) has few calcium elution volumes, and cannot form only the protective film which blocks a corrosion origin less than by 1/99 but 99/1 is exceeded on the other hand Since silicon oxide required for making phosphoric-acid ion and calcium required starting the calcium and complexation reaction the calcium of the amount beyond the need not only being eluted, but adsorb for formation of a protective film is not fully supplied, sufficient self-repair effectiveness is not acquired.

[0093] (e) molybdate of the above (7), (f) triazoles, thiols, In one or more sorts of organic compounds chosen from thiadiazole, thiazoles, and thiurams, and the rust-proofing addition component which blended (i) calcium ion-exchange silica 20 / 80 - 80/20 are still more preferably suitable. the compounding ratio of these (e), (f), and (i) -- the weight ratio of solid content -- (e)/(f) = 1 / 99 - 99/1 -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable. (e) -- /(i) = 1 / 99 - 99/1 -- desirable -- 10 / 90 - 90/10 -- (f) -- /(i) = 1 / 99 - 99/1 -- desirable -- 10 / 90 - 90/10 -- 20 / 80 - 80/20 are still more preferably suitable. Here, the effectiveness by (e)/(f) and (e) /(i) and (f)/(i) compounding less than 1/99 and then different self-repair effectiveness by exceeding 99/1, respectively is not fully acquired.

[0094] Loadings of the sum total of the above-mentioned rust-proofing addition component (B) in the inside of an organic resin coat (the above-mentioned component (a) either of - (f)) Or the loadings of the sum total of the self-repair nature manifestation matter which carried out compound addition of other components to the above (e) and/or (f) the base resin 100 weight section (solid content) -- receiving -- the 1 - 100 weight section (solid content) -- desirable -- 5 - 80 weight section (solid content) -- it considers as 10 - 50 weight section (solid content) still more preferably. The corrosion-resistant improvement effectiveness has the small loadings of a rust-proofing addition component (B) in under 1 weight section. On the other hand, if loadings exceed the 100 weight sections, since corrosion resistance will fall, it is not desirable.

[0095] Into an organic coat, it adds to the above-mentioned rust-proofing addition component. Moreover, as a corrosion inhibitor other oxide particles (for example, an aluminum oxide and a

zirconium dioxide --) Molybdophosphate, such as titanium oxide, cerium oxide, and antimony oxide A (molybdophosphoric acid aluminum etc. and organic phosphorus) acid and its salt [for example,] for example, phytic acid, a phytic acid salt, phosphonic acid, and phosphonate -- And these metal salts, an alkali-metal salt, an alkaline earth metal salt, etc. can add one sort, such as organic inhibitor (for example, a hydrazine derivative, thiol compounds, dithiocarbamate, etc.), or two sorts or more.

[0096] Into an organic coat, further, if needed, solid lubricant (C) can be blended in order to raise the workability of a coat. As solid lubricant (C) applicable to this invention, the following is mentioned and these one sort or two sorts or more can be used, for example.

(1) The Pori polyvinyl fluoride, the (2) fluororesin particle:, for example, poly fluoro ethylene resin, (Pori polytetrafluoroethylene resin etc.), such as polyolefine wax and paraffin wax:, for example, polyethylene wax, synthetic paraffin, native paraffin, micro wax, and a chlorinated hydrocarbon, polyvinylidene fluoride resin [0097], etc. moreover -- in addition, a fatty-acid amide system compound (for example, octadecanamide --) A palmitic-acid amide, methylenebisstearamide, ethylene-bis-stearamide, Oleic amide, an ESHIRU acid amide, an alkylene screw fatty-acid amide, etc., metal soap (for example, calcium stearate and lead stearate --) One sort, such as metallic sulfide (for example, molybdenum disulfide, tungsten disulfide, etc.), graphite, and graphites fluoride, such as lauric-acid calcium and palmitic-acid calcium, boron nitride, a polyalkylene glycol, and an alkali-metal sulfate, or two sorts or more may be used.

[0098] Also in the above solid lubricant, polyethylene wax and a fluororesin particle (even inside Pori polytetrafluoroethylene resin particle) are suitable especially. as polyethylene wax -- auction dust by Hoechst A.G. for example 9615A and auction dust 3715 and auction dust 3620 and auction dust 3910 and Mitsuhiro -- Formation -- Sun Wacks of make 131-P and Sun Wacks CHEMIPEARL made from 161-P and Mitsui Petrochemistry W-100 and CHEMIPEARL W-200, CHEMIPEARL W-500, and CHEMIPEARL W-800 and CHEMIPEARL W-950 etc. can be used.

[0099] Moreover, as a fluororesin particle, a tetrafluoroethylene particle is the most desirable, for example, it is RUBURON by Daikin Industries, LTD. L-2, RUBURON L-5, Mitsui and 1200 by E. I. du Pont de Nemours & Co., Fluon dispersion by Asahi-ICI Fluoropolymers Co., Ltd. AD1, Fluon dispersion AD2, Fluon L141J, Fluon L150J, Fluon L155J etc. are suitable. [MP1100 and MP1200] Moreover, the lubrication effectiveness which was excellent with especially concomitant use of a polyolefine wax and a tetrafluoroethylene particle is expectable in these.

[0100] the loadings of the solid lubricant (C) in the inside of an organic coat -- the base resin 100 weight section (solid content) -- receiving -- 1 - 80 weight section (solid content) -- it considers as 3 - 40 weight section (solid content) preferably. The lubrication effectiveness is deficient in the loadings of solid lubricant (C) in under 1 weight section, and since paintwork will fall on the other hand if loadings exceed 80 weight sections, it is not desirable.

[0101] The organic coat which the organic covering steel plate of this invention has usually uses specific organic macromolecule resin (A) as base resin. (a) calcium ion-exchange silica and phosphate which are the self-repair nature manifestation matter at this, (b) calcium ion-exchange silica, phosphate and silicon oxide, the (c) lime compound, and silicon oxide, (d) A lime compound, phosphate and silicon oxide, (e) molybdate, (f) Triazoles, thiols, thiadiazole, and thiazoles one or more sorts of organic compounds chosen from thiurams, and **, although the rust-proofing addition component (B) which carried out compound addition of other components is blended with inner either or the above (e), and/or (f) and solid lubricant (C), a curing agent, etc. are added if needed further -- the need -- responding -- as an additive -- an organic color pigment (for example, a condensed multi-ring system organic pigment --) coloring colors (for example, organic solvent fusibility azo dye --), such as a phthalocyanine system organic pigment Inorganic pigments, such as a water-soluble azo metal color (for example, titanium oxide etc.), chelating agents (for example, thiol etc.) and a conductive pigment (for example, zinc --) Metal powder, such as aluminum and nickel, Lynn-ized iron, antimony dope mold tin oxide, etc. can add one sort, such as coupling agents (for example, a silane coupling agent, a titanium coupling agent, etc.) and a melamine cyanuric acid addition product, or two sorts or more.

[0102] Moreover, the coating constituent containing the above-mentioned base resin and an addition

component for coat formation usually contains a solvent (an organic solvent and/or water), and a neutralizer etc. is added further if needed. An organic coat which was described above is formed in the upper part of the above-mentioned multiple oxide coat. The desiccation thickness of an organic coat sets preferably 0.3-3-micrometer 0.1-5 micrometers to 0.5-2 micrometers still more preferably. The thickness of an organic coat has the insufficient corrosion resistance of less than 0.1 micrometers, and on the other hand, if thickness exceeds 5 micrometers, conductivity and workability will fall. Moreover, it is appropriate to make coating weight of an organic coat into two or more 0.15 g/m and less than two 0.5 g/m preferably two or more 0.1 g/m and less than two 0.5 g/m to obtain advanced conductivity and spot welding nature with corrosion resistance. The coating weight of an organic coat has the insufficient corrosion resistance of less than two 0.1 g/m, and, on the other hand, the very advanced conductivity and spot welding nature which coating weight considers as a request in two or more 0.5 g/m are not obtained.

[0103] the multiple oxide coat (a component (alpha), the component (beta) in the amount of P2O5 conversions, and Mg --) with which are satisfied of this invention conditions which become a galvanized steel sheet from the constituent for the 1st layer coats of No.1 of Table 2 and 3 on a front face Sum total coating weight of the component (gamma) in the amount of metal conversions of Mn and aluminum : 359 mg/m² is formed. About the organic covering steel plate in which the organic coat which consists of a constituent for coats which carried out 15 weight sections combination of the rust-proofing addition component of No.15 of Table 5 to the solid content 100 weight section of the resin constituent for the 2nd layer coats of No.1 of Table 4 (base resin: thermosetting epoxy resin) was formed in the upper part The result of having investigated the relation of the coating weight of an organic coat and conductivity same with drawing 2 for the result of having investigated the relation between the coating weight of an organic coat and spot welding nature for the result of having investigated the relation between the coating weight of an organic coat and corrosion resistance, as well as drawing 1 is shown in drawing 3, respectively. In addition, corrosion resistance performed the compound corrosion test (CCT) which evaluated white-rust-proof in [the example 1], and evaluated it by the same valuation basis as [an example 1] based on the rate of white rust generating area after 20 cycles. Moreover, the trial same about spot welding nature and conductivity as [an example 2] was performed, and the same valuation basis estimated.

[0104] According to drawing 1, corrosion resistance to the extent that the coating weight of an organic coat increases improves, and by making coating weight into two or more 0.15 g/m preferably two or more 0.1 g/m shows that good corrosion resistance is acquired. On the other hand, if the coating weight of an organic coat becomes two or more 0.5 g/m according to drawing 2, spot welding nature (spot continuation RBI nature) will fall rapidly, and conductivity is also known by getting worse rapidly when the coating weight of an organic coat becomes two or more 0.5 g/m according to drawing 3. In order to obtain the outstanding corrosion resistance, especially advanced conductivity, and spot welding nature from the above reason, it is appropriate to make coating weight of an organic coat into two or more 0.15 g/m and less than two 0.5 g/m preferably two or more 0.1 g/m and less than two 0.5 g/m.

[0105] Next, the manufacture approach of the organic covering steel plate of this invention is explained. After the organic covering steel plate of this invention processes the front face of a zinc system plating steel plate or an aluminum system plating steel plate with the processing liquid containing the constituent of the multiple oxide coat mentioned above (processing liquid is applied), Carry out stoving and, subsequently to the upper layer, the organic macromolecule resin (A) mentioned above is used as base resin. (a) calcium ion-exchange silica and phosphate, (b) calcium ion-exchange silica, Phosphate and silicon oxide, the (c) lime compound, and silicon oxide, (d) A lime compound, phosphate and silicon oxide, (e) molybdate, (f) Triazoles, thiols, thiadiazole, and thiazoles one or more sorts of organic compounds chosen from thiurams, and ** -- inner either Or it is manufactured by applying and carrying out stoving of the coating constituent with which the rust-proofing addition component (B) which carried out compound addition of other components was added by the above (e) and/or (f), and solid lubricant (C) etc. was added further if needed. In addition, in order that the front face of a plating steel plate may carry out alkaline-degreasing processing if needed and may raise adhesion and corrosion

resistance further before it applies the above-mentioned processing liquid, it can pretreat surface control processing etc.

[0106] In order to process the front face of a zinc system plating steel plate or an aluminum system plating steel plate with processing liquid and to form a multiple oxide coat (**) -- an oxide particle and (**) -- a phosphoric acid and/or a phosphoric-acid compound, and Mg (Ha) -- The metal ion of the either Mn or the aluminum, the water-soluble ion containing at least one sort in said metal, One or more sorts chosen from the groups which consist of a compound containing at least one sort in said metal, and a conjugated compound containing at least one sort in said metal, It contains, and processes with the processing liquid (water solution) which added each addition component (an organic resinous principle, an iron-group metal ion, a corrosion inhibitor, other additives) further mentioned above if needed, and an appropriate thing [carrying out afterbaking desiccation] is desirable.

[0107] here -- as the above-mentioned processing liquid -- the mol concentration of said addition component (**), the sum total mol concentration of 2OP5 conversion of said addition component (**), and the sum total mol concentration of the amount conversion of metals of said metal of said addition component (Ha) -- mole-ratio (**) -- $/(Ha) = 0.1-20$ and the processing liquid adjusted so that $0.1-10$, and a mole ratio $(Ha) / (b) = 0.1-1.5$ might be satisfied preferably are used. said mole-ratio (**) -- if $/(Ha)$ is not fully obtained less than by 0.1 but the addition effectiveness of an oxide particle exceeds 20 on the other hand, an oxide particle will check the eburnation of a coat. Moreover, effectiveness is not fully acquired for the above-mentioned mole ratio $(Ha)/(b)$ by addition of metal components, such as Mg, less than by 0.1 , but on the other hand, if 1.5 is exceeded, processing liquid ammonia quality will fall.

[0108] As an oxide particle which is addition component (**), silicon oxide (SiO_2 particle) is the most desirable. This silicon oxide can use a commercial silica sol, water-dispersion silicic-acid oligomer, etc. in processing liquid that what is necessary is just a stable water-dispersion silica particle. However, as for fluorides, such as a hexafluorosilicic acid, corrosive is strong, and since the effect on the body is also large, it is desirable [fluorides] not to use it from viewpoints, such as effect on work environment. the addition (in the case of silicon oxide, it is an addition as SiO_2 amount) of the oxide particle in the inside of processing liquid -- $0.001-3.0\text{mol/L}$ -- it is preferably appropriate $0.05-1.0\text{mol/L}$, and to be referred to as $0.1-0.5\text{mol/L}$ still more preferably. Under 0.001 mols / L are not enough as the effectiveness according [the addition of an oxide particle] to addition, and there is an inclination for corrosion resistance to be inferior. On the other hand, if an addition exceeds 3.0 mols / L, the water resisting property of a coat will worsen, and there is an inclination for corrosion resistance to also deteriorate as a result.

[0109] As the phosphoric acid which is addition component (b), and/or a phosphoric-acid compound Polyphosphoric acid, such as orthophosphoric acid, a pyrophosphoric acid, and the Tripoli phosphoric acid, metaphosphoric acids, and these mineral salt For example, (the first aluminium phosphate etc. and phosphorous acid), phosphite, The anion produced when compounds of phosphoric-acid content, such as hypophosphorous acid and hypophosphite, dissolve in a water solution, Or the gestalt which exists as complex ion with a metal cation, the gestalt which exists as a free acid, The amount of the phosphoric-acid component in this invention specifies the sum total of all these [which exist in processing liquid] gestalten as 2OP5 conversion including all, such as a gestalt which exists in the state of moisture powder as mineral salt.

[0110] the addition of the phosphoric acid in the inside of processing liquid, and/or a phosphoric-acid compound -- 2OP5 conversion -- $0.001-6.0\text{mol/L}$ -- it is preferably appropriate $0.02-1.0\text{mol/L}$, and to be referred to as $0.1-0.8\text{mol/L}$ still more preferably. Under 0.001 mols / L are not enough as the effectiveness according [the addition of a phosphoric acid and/or a phosphoric-acid compound] to addition, and there is an inclination for corrosion resistance to be inferior. if an addition, on the other hand, exceeds 6.0 mols / L -- superfluous phosphoric-acid ion -- a humid environment -- setting -- a plating coat -- reacting -- corrosive environment -- the corrosion of a plating base -- promoting -- discoloration and silverfish -- it becomes the factor of the ** rust generating. Moreover, since the corrosion resistance outstanding multiple oxide can be obtained as addition component (b), it is also effective to use an ammonium phosphate salt. As an ammonium phosphate salt, it is desirable to use one

sort, such as monobasic ammonium phosphate and dibasic calcium phosphate, or two sorts or more.

[0111] Although a compound and a conjugated compound are sufficient as an existence-in processing liquid of addition component (Ha) gestalt, in order to acquire the especially excellent corrosion resistance, especially the gestalt of the water-soluble ion with which the metal ion of Mg, Mn, and aluminum or the metal of Mg, Mn, and aluminum is contained is desirable. In addition, in order to supply the ion of an addition component (Ha) as a metal salt, anions, such as a chlorine ion, nitrate ion, sulfate ion, acetic-acid ion, and boric-acid ion, may be added in processing liquid. The amount of the component of Mg, Mn, and aluminum in this invention specifies the sum total of all these [which exist in processing liquid] gestalten as amount conversion of metals.

[0112] It is appropriate for the addition of the above-mentioned addition component (Ha) in the inside of processing liquid 0.001-3.0mol/L, and to be preferably referred to as 0.01-0.5mol/L in the sum total of the amount conversion of metals. The effectiveness according [the addition of these sum totals] to addition is not fully acquired, but on the other hand, if an addition exceeds 3.0 mols / L, these components will come to check the network of a coat conversely, and a precise coat will become impossible in less than 0.001 mols easily. Moreover, a metal component becomes easy to be eluted from a coat; and the defect of an appearance discoloring depending on an environment is produced.

[0113] In processing liquid, as addition component (d), further The metal ion of the nickel, Fe, or the Co (es), By being able to carry out optimum dose addition of the one or more sorts chosen from the groups which consist of water-soluble ion containing at least one sort in said metal, and adding such an iron-group metal The black discoloration phenomenon resulting from the corrosion of the plating outermost layer under a humid environment produced when not adding an iron-group metal is avoidable.

Moreover, the effectiveness of nickel is high also especially in these iron-group metals, and the effectiveness excellent also in the minute amount is accepted. However, since superfluous addition of iron-group metals, such as nickel and Co, leads to corrosion-resistant degradation, addition of optimum dose is required for it.

[0114] As an addition of the above-mentioned addition component (**), it is the amount conversion of metals and it is desirable 1 / to make 10000-1 mol into 1 / the range of 10000 - 1/100 mol desirably to one mol (Ha) of addition components in the amount conversion of metals. If less than 1/10000 mol is not enough as the effectiveness according [the addition of addition component (**)] to addition and an addition exceeds one mol on the other hand to one mol (Ha) of addition components, corrosion resistance will deteriorate as mentioned above. Into processing liquid, optimum dose addition of the addition component to the inside of the coat described previously may be carried out besides the above-mentioned addition component (b) - (d). It is appropriate 0.5-5, and to set pH of processing liquid (water solution) to 2-4 preferably. Since the reactivity of processing liquid becomes [processing liquid] high too much by less than 0.5 pH, a detailed defective part is formed in a coat, and corrosion resistance falls. On the other hand, if processing liquid exceeds pH5, the reactivity of processing liquid will become low, it becomes inadequate joining [of the interface of a plating coat and a multiple oxide coat] together, and there is an inclination for corrosion resistance to fall also in this case.

[0115] As an approach of coating a plating steel plate front face with processing liquid, any of a spreading method, an immersion method, and a spray method are sufficient, and which spreading means, such as roll coaters (3 roll methods, 2 roll methods, etc.), a squeeze coating machine, and a die coating machine, may be used by the spreading method. Moreover, it is also possible to perform adjustment of coverage, equalization of an appearance, and equalization of thickness by the air knife method or the roll extracting method after the spreading processing by a squeeze coating machine etc., immersion processing, and spray processing. Although there is no constraint special to the temperature of processing liquid, about ordinary temperature -60 degree C is suitable. Below in ordinary temperature, since the facility for cooling etc. is needed, it is uneconomical, and on the other hand, since moisture will become easy to evaporate if it exceeds 60 degrees C, management of processing liquid becomes difficult.

[0116] After coating processing liquid as mentioned above, stoving is usually performed, without rinsing, but the processing liquid used by this invention may rinse after processing in order to form a

poorly soluble salt by the reaction with a substrate plating steel plate. The approach of carrying out stoving of the coated processing liquid is arbitrary, for example, can use the means of a dryer, an air-heating furnace, a high-frequency-induction-heating furnace, an infrared furnace, etc. As for this stoving processing, it is desirable to perform desirably 80-200-degrees C 50-300 degrees C in 80-160 degrees C still more desirably by attainment board temperature. At less than 50 degrees C, moisture remains so much into a coat and stoving temperature becomes inadequate [corrosion resistance]. On the other hand, if stoving temperature exceeds 300 degrees C, it is not only noneconomic, but it will become easy to produce a defect in a coat, and corrosion resistance will fall.

[0117] After forming a multiple oxide coat in the front face of a zinc system plating steel plate or an aluminum system plating steel plate as mentioned above, the coating constituent for organic coat formation is applied to the upper layer. As an approach of applying a coating constituent, the approach of arbitration, such as the applying method, dip coating, and a spray method, is employable. As an applying method, which approaches, such as roll coaters (3 roll methods, 2 roll methods, etc.), a squeeze coating machine, and a die coating machine, may be used. Moreover, it is also possible to perform adjustment of coverage, equalization of an appearance, and equalization of thickness by the air knife method or the roll extracting method after the spreading processing by a squeeze coating machine etc., immersion processing, or spray processing.

[0118] Although stoving is performed after spreading of a coating constituent, without usually rinsing, a rinsing process may be carried out after spreading of a coating constituent. A dryer, an air-heating furnace, a high-frequency-induction-heating furnace, an infrared furnace, etc. can be used for stoving processing. As for heat-treatment, it is desirable to perform 50-350 degrees C in 80 degrees C - 250 degrees C preferably by attainment board temperature. At less than 50 degrees C, the moisture in a coat remains so much and whenever [stoving temperature] becomes inadequate [corrosion resistance]. Moreover, when whenever [stoving temperature] exceeds 350 degrees C, there is a possibility it is not only noneconomic, but that a defect may arise in a coat and corrosion resistance may fall.

[0119] This invention contains the steel plate which has a coat which was described above on both sides or one side. Therefore, as a gestalt of this invention steel plate, there is the following, for example.

(1) one side: -- a plating coat-multiple oxide coat-organic coat and an one side:plating coat (2) one side:plating coat-multiple oxide coat-organic coat -- one side: -- plating coat-well-known double-sided [phosphate processing coat etc.] (3): -- plating coat-multiple oxide coat-organic coat (4) one side: -- a plating coat-multiple oxide coat-organic coat -- one side: -- plating coat-multiple oxide coat (5) one side: -- a plating coat-multiple oxide coat-organic coat and an one side:plating coat-organic coat [0120]

[Example] The resin constituent for the 2nd layer coat formation shown with the processing liquid for the 1st layer coat formation (coat constituent) shown in [example 1] Table 2 and 3 in Table 4 was adjusted. The solid lubricant shown in the rust-proofing addition component (self-repair nature manifestation matter) shown in Table 5 (Table 5-1 and 5-2) and Table 6 was suitably blended with the resin constituent shown in Table 4, need time amount distribution was carried out using the disperser for coatings (Sand grinder), and it considered as the desired coating constituent.

[0121] In order to obtain household electric appliances, building materials, and the organic covering steel plate for autoparts, board thickness:0.8mm, The plating steel plate shown in Table 1 which performed various zinc system plating or aluminum system plating to Surface roughness Ra:1.0micrometer cold rolled sheet steel is used as a processing negative. After alkaline-degreasing-processing and rinsing drying the front face of this plating steel plate, stoving of the processing liquid (coat constituent) shown in Table 2 and 3 was applied and carried out by the roll coater, and the 1st layer coat was made to form. The solid content (heating residue) or the spreading conditions of processing liquid (rolling force of a roll, rotational speed, etc.) adjusted the thickness of this 1st layer coat. Subsequently, applied the coating constituent shown in Table 4 by the roll coater, it carried out stoving, the 2nd layer coat was made to form, and the organic covering steel plate of the example of this invention and the example of a comparison was manufactured. The solid content (heating residue) or the spreading conditions of a coating constituent (rolling force of a roll, rotational speed, etc.) adjusted the thickness of the 2nd layer coat.

[0122] About the obtained organic covering steel plate, the quality engine performance (a coat appearance, white-rust-proof, the white-rust-proof after alkaline degreasing, coating adhesion, workability) was evaluated. The result is shown in Table 7 - 39 with the coat configuration of the 1st layer coat and the 2nd layer coat etc. Evaluation of the quality engine performance of an organic covering steel plate was performed by [as being the following].

(1) The homogeneity (existence of nonuniformity) of a coat appearance was evaluated by viewing about coat appearance each sample. The valuation basis is as follows.

O : the appearance in which the appearance x:nonuniformity in which nonuniformity completely twists and uniform appearance **:nonuniformity is conspicuous a little is conspicuous [0123] (2) The compound corrosion test (CCT) shown below about white-rust-proof each sample was performed, and the rate of white rust generating area after a predetermined cycle estimated.

[The contents of 1 cycle of a compound corrosion test (CCT)]

3wt% salt spray test (30 degree-C;0.5 hour)

** humidity cabinet test (30 degrees C, 95%RH; 1.5 hours)

** hot-air-drying trial (50 degrees C, 20%RH; 2.0 hours)

** hot-air-drying trial (30 degrees C, 20%RH; 2.0 hours)

The valuation basis is as follows.

O O[-:white-rust-generating-less]+: Less than [5% of rates of white rust generating area] O : 5% or more of rates of white-rust generating area, 10% or more of rates of less than 10%O-:white-rust area, less-than [25%] ** : 25% or more of rates of white rust generating area, less than [50%] x : 50% or more of rates of white rust generating area [0124] (3) After performing alkaline degreasing by alkali treatment liquid CLN-364S (60 degrees C, spray 2 minutes) by Nihon Parkerizing Co., Ltd., the above-mentioned compound corrosion test (CCT) was performed, and the rate of white rust area after a predetermined cycle estimated white-rust-proof each sample after alkaline degreasing. The valuation basis is as follows.

O O[-:white-rust-generating-less]+: Less than [5% of rates of white rust generating area] O : 5% or more of rates of white-rust generating area, 10% or more of rates of less than 10%O-:white-rust generating area, less-than [25%] ** : 25% or more of rates of white rust generating area, less than [50%] x : 50% or more of rates of white rust generating area [0125] (4) After painting the baking paint (30 micrometers of thickness) of a melamine system, it was immersed into priming for 2 hours, the cut of the squares (it is the squares of 10x10 at intervals of 1mm) was put in immediately, attachment and exfoliation by adhesive tape were performed, and the stripped plane moment of a paint film estimated coating adhesion each sample. The valuation basis is as follows.

O 5% or more of less than 5% [of -:exfoliation-less O:stripped plane moments] **:stripped plane moments, less than [20%] x : 20% or more of stripped plane moments [0126] (5) Deep-drawing shaping (non-oiling conditions) was performed by diameter phiof workability blank120mm, and diameter phiof dice50mm, and shaping height until a crack arises estimated. The valuation basis is as follows.

O :diaphragm omission O:height [shaping / of 30mm or more] **:shaping height of 20mm or more, less than [30mm] x : shaping height of less than 20mm [0127]

[Table 1]

表 1

No.	種 類	付着量 (g/m ²)
1	電気亜鉛めっき鋼板	20
2	熔融亜鉛めっき鋼板	60
3	合金化熔融亜鉛めっき鋼板 (Fe:10wt %)	60
4	熔融 Zn-Al 合金めっき鋼板 (Al:55wt %)	90
5	熔融 Zn-5wt % Al-0.5wt % Mg 合金めっき鋼板	90
6	熔融アルミニウムめっき鋼板 (Al-6wt % Si 合金めっき)	60

[0128]

[Table 2]

表 2

〔第一層皮膜用組成物〕

No.	酸化物微粒子 (イ)		Mg, Mn, Al (ハ)		リン酸・リン酸化合物 (ロ)		有機樹脂	
	種 類	濃 度 (M/L)	種 類	濃 度 (M/L) *1	種 類	濃 度 (M/L) *2	種 類	濃 度 (g/l)
1	コロイダルシリカ	0.3	Mn	0.10	オルトリン酸	0.20	—	—
2	コロイダルシリカ	0.04	Mn	0.10	オルトリン酸	0.20	—	—
3	コロイダルシリカ	0.3	Mn	0.10	オルトリン酸	0.50	—	—
4	コロイダルシリカ	0.33	Mn	0.11	オルトリン酸	0.10	—	—
5	コロイダルシリカ	1.8	Mn	0.10	オルトリン酸	0.20	—	—
6	コロイダルシリカ	0.3	Mn	0.10	オルトリン酸	0.20	アクリルースチレン系水分散性樹脂	180
7	コロイダルシリカ	0.3	Al	0.10	オルトリン酸	0.20	—	—
8	コロイダルシリカ	0.04	Al	0.10	オルトリン酸	0.20	—	—
9	コロイダルシリカ	0.3	Al	0.10	オルトリン酸	0.50	—	—
10	コロイダルシリカ	0.3	Al	0.10	オルトリン酸	0.20	—	—
11	コロイダルシリカ	0.33	Al	0.11	オルトリン酸	0.10	—	—
12	アルミナゾル	0.3	Al	0.10	オルトリン酸	0.20	—	—
13	コロイダルシリカ	0.3	Mg	0.10	オルトリン酸	0.20	—	—
14	—	—	Mn	0.10	オルトリン酸	0.20	—	—
15	—	—	Al	0.10	オルトリン酸	0.20	—	—
16	—	—	Mg	0.10	オルトリン酸	0.20	—	—
17	コロイダルシリカ	0.3	—	—	オルトリン酸	0.20	—	—
18	コロイダルシリカ	0.3	Mn	0.10	—	—	—	—
19	コロイダルシリカ	0.3	Al	0.10	—	—	—	—
20	コロイダルシリカ	0.3	Mg	0.10	—	—	—	—
21	リチウムシリケート	1.0	—	—	—	—	—	—

*1 Mg, Mn, Al の金属量換算の合計モル濃度

*2 P・O 換算の合計モル濃度

[0129]

[Table 3]

表 3

No.	モル比 (イ)/(ハ)	モル比 (ハ)/(ロ)	本発明条件の適否 *3
1	3.0	0.5	○
2	0.4	0.5	○
3	3.0	0.2	○
4	3.0	1.1	○
5	18.0	0.5	○
6	3.0	0.5	○
7	3.0	0.5	○
8	0.4	0.5	○
9	3.0	0.2	○
10	3.0	1.1	○
11	18.0	0.5	○
12	3.0	0.5	○
13	3.0	0.5	○
14	—	0.5	×
15	—	0.5	×
16	—	0.5	×
17	—	—	×
18	3.0	—	×
19	3.0	—	×
20	3.0	—	×
21	—	—	×

*3 ○：本発明条件を満足する

×：本発明条件を満足しない

[0130]

[Table 4]

表 4

No.	分類	種類 (主剤/硬化剤)	基体樹脂
1	熱硬化性樹脂	エポキシ樹脂/尿素樹脂	エピコート E-1009 (*1)/ベッカミン P196M (*2) = 85/15
2	熱硬化性樹脂	ジエタノール変性エポキシ樹脂/ ブロックウレタン樹脂	ER-007 (*3)/デュラネート MF-K60X (*4) = 90/10
3	熱硬化性樹脂	高分子量オイルフリーアルキッド樹脂/ メラミン樹脂	ベッコライト M-6206 (*5)/サイメル 352 (*6) = 85/15
4	熱硬化性樹脂	高分子量オイルフリーアルキッド樹脂/ メラミン樹脂	パイロン GK-19CS (*7)/サイメル 325 (*6) = 85/15
5	水系樹脂	エチレンアイオノマー樹脂	三井化学工業㈱製ケミパール S-650 (固形分 27%)
6	水系樹脂	ポリウレタンディスパージョン	第一工業製薬㈱製スーパーフレックス 150 (固形分 30%)
7	水系樹脂	エポキシディスパージョン	三井化学工業㈱製エボミック WR-942 (固形分 27%)
8	水系樹脂	塩化ビニリデンラテックス	呉羽化学工業㈱製クレハロンラテックス AO (固形分 48%)

*1 油化シェル㈱製, エポキシ樹脂のブチセロブ溶液 (固形分 40%)

*2 大日本インキ化学工業㈱製, 尿素樹脂 (固形分 60%)

*3 関西ペイント㈱製, ジエタノール変性エポキシ樹脂 (固形分 50%)

*4 旭化成工業㈱製, ブロックウレタン樹脂 (固形分 60%)

*5 大日本インキ化学工業㈱製, 高分子量オイルフリーアルキッド樹脂 (固形分 60%)

*6 三井サイテック㈱製, メラミン樹脂 (固形分 80%)

*7 東洋紡績㈱製, 高分子量オイルフリーアルキッド樹脂 (固形分 40%)

[0131]

[Table 5]

表 5-1

No	防錆添加成分 (自己補修性発現物質)			配合比*1
	(a) Ca イオン交換シリカ + リン酸塩 (b) Ca イオン交換シリカ + リン酸塩 + 酸化ケイ素 (c) カルシウム化合物 + 酸化ケイ素 (d) カルシウム化合物 + リン酸塩 + 酸化ケイ素 (e), (h), (i) その他の成分	(e) モリブデン酸塩	(f) トリアゾール類, チオール類, チアジアゾール類, チアゾール類, チウラム類の中から選ばれる1種以上の有機化合物	
1	Ca イオン交換シリカ + リン酸 Zn (配合比 1 : 1 *1)	—	—	—
2	Ca イオン交換シリカ + リン酸 Zn + シリカ (配合比 1 : 1 : 1 *1)	—	—	—
3	酸化 Ca + シリカ + トリポリリン酸二水素 Al (配合比 1 : 1 : 1 *1)	—	—	—
4	酸化 Ca + シリカ	—	—	—
5	—	リン酸 Mo 酸 Al	—	—
6	—	リン酸 Mo 酸 CaZn	—	—
7	—	—	5-アミノ-3-メルカプト-1,2,4-トリ アゾール	—
8	—	—	1,3,5-トリアジン-2,4,6-トリチオ- ール	—
9	—	—	5-アミノ-2-メルカプト-1,3,4-チア ジアゾール	—
10	—	—	2-メルカプトベンゾチアゾール	—
11	—	—	テトラエチルチウラムジスルフィ ド	—

*1 重量比

表 5-2

No	防錆添加成分 (自己補修性発現物質)			配合比*1
	(a)Caイオン交換シリカ+リン酸塩 (b)Caイオン交換シリカ+リン酸塩+酸化ケイ素 (c)カルシウム化合物+酸化ケイ素 (d)カルシウム化合物+リン酸塩+酸化ケイ素 (e), (b), (d)その他の成分 (f)ケイ酸Ca+トリポリリン酸二水素Al (配合比 1 : 1 * 1) (g)Caイオン交換シリカ	(c)モリブデン酸塩 リン酸 Mo 酸 Al	(f)トリアゾール類, チオール類, チアジアゾール類, チアゾール類, チウラム類の中から選ばれた 1 種以上の有機化合物	
12	—	—	—	10 : 10 : 0
13	—	—	—	10 : 0 : 10
14	—	—	—	0 : 10 : 10
15	ケイ酸Ca+トリポリリン酸二水素Al (配合比 1 : 1 * 1)	リン酸 Mo 酸 Al	テトラエチルチウラムジスルフィド	10 : 10 : 10
16	酸化Ca+シリカ (配合比 1 : 1 * 1)	リン酸 Mo 酸 Al	—	10 : 10 : 0
17	Caイオン交換シリカ	リン酸 Mo 酸 Al	—	10 : 10 : 0
18	酸化Ca+リン酸Zn (配合比 1 : 1 * 1)	—	テトラエチルチウラムジスルフィド	10 : 0 : 10
19	酸化Ca+シリカ (配合比 1 : 1 * 1)	—	テトラエチルチウラムジスルフィド	10 : 0 : 10
20	酸化Ca+シリカ (配合比 1 : 1 * 1)	リン酸 Mo 酸 Al	テトラエチルチウラムジスルフィド	10 : 10 : 10
21	Caイオン交換シリカ	リン酸 Mo 酸 Al	テトラエチルチウラムジスルフィド	10 : 10 : 10

*1 重量比

[0132]

[Table 6]

表 6

[固形潤滑剤]

No	種 類	商 品 名
1	ポリエチレンワックス	日本精糖製 “LUVAX1151”
2	ポリエチレンワックス	セリダスト製 “3620”
3	ポリエチレンワックス	三井石油化学製 “ケミパール W-100”
4	テトラフルオロエチレン樹脂	三井・デュポン製 “MP1100”
5	テトラフルオロエチレン樹脂	ダイキン工業製 “L-2”
6	No 1 と No 4 の混合物 (混合比 = 1 : 1)	—

[0133] Following Table 7 - 39 is indicated to front Naka. *1-*7 The following contents are shown.

*1: The plating steel plate No given in Table 1

*2: The constituent No for the 1st layer coats given in Table 2 and 3

*3: A component (beta) is the coating weight of 2OP5 conversion, and a component (gamma) is the resin constituent No for the 2nd layer coats given in the coating weight *4:table 4 of the amount conversion of metals of Mg, Mn, and aluminum.

*5: The rust-proofing addition component No given in Table 5

*6: Solid lubricant No given in Table 6

*7: Loadings to the solid content 100 weight section of a resin constituent (weight section)

[0134]

[Table 7]

表 7

No.	めつき鋼板 *1	第一層皮膜									区 分
		皮 膜 組成物 *2	乾燥 温度 (℃)	膜厚 (μm)	皮膜付着量				皮膜成分のモル比		
					合 計 付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ)	(γ)/(β)	
									*3	*3	
1	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
2	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
3	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
4	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
5	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
6	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
7	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
8	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例

[0135]

[Table 8]

表 8

No.	第二層皮膜						区 分	
	樹 脂 組成物	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度		膜厚 (μm)
		種類 *4	配合量 *5	種類 *6	配合量 *7			
1	1	15	15	—	—	140	1.0	本發明例
2	2	15	15	—	—	140	1.0	本發明例
3	3	15	15	—	—	140	1.0	本發明例
4	4	15	15	—	—	140	1.0	本發明例
5	5	15	15	—	—	140	1.0	本發明例
6	6	15	15	—	—	140	1.0	本發明例
7	7	15	15	—	—	140	1.0	本發明例
8	8	15	15	—	—	140	1.0	本發明例

[0136]

[Table 9]

表 9

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
1	○	◎	◎	◎	—	本発明例
2	○	◎	◎	◎	—	本発明例
3	○	○+	○	◎	—	本発明例
4	○	○+	○	◎	—	本発明例
5	○	○	○—	◎	—	本発明例
6	○	○	○—	◎	—	本発明例
7	○	○	○—	◎	—	本発明例
8	○	○	○—	◎	—	本発明例

[0137]

[Table 10]

表 10

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜 組 成 物	乾燥 温度 (℃)	膜厚 (μm)	皮膜付着量 *3				皮膜成分のモル比		
					合 計 付 着 量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ) *3	(γ)/(β) *3	
9	1	2	140	0.3	344	30	245	69	0.4	0.5	本発明例
10	1	3	140	0.3	363	90	245	28	3.0	0.2	本発明例
11	1	4	140	0.3	360	200	99	61	3.0	1.1	本発明例
12	1	5	140	0.3	358	290	53	15	18.0	0.5	本発明例
13	1	6	140	0.3	600	150	163	46	3.0	0.5	本発明例
14	1	7	140	0.3	358	160	174	24	3.0	0.5	本発明例
15	1	8	140	0.3	360	35	286	39	0.4	0.5	本発明例
16	1	9	140	0.3	349	90	245	14	3.0	0.2	本発明例
17	1	10	140	0.3	362	220	109	33	3.0	1.1	本発明例
18	1	11	140	0.3	362	300	54	8	18.0	0.5	本発明例

[0138]

[Table 11]

表 1 1

No.	第二層皮膜							区 分
	樹脂組成物 *4	防錆添加成分(B)		固形潤滑剤(C)		乾燥 溫度 (℃)	膜厚 (μm)	
		種類 *5	配合量 *7	種類 *6	配合量 *7			
9	1	15	15	—	—	140	1.0	本発明例
10	1	15	15	—	—	140	1.0	本発明例
11	1	15	15	—	—	140	1.0	本発明例
12	1	15	15	—	—	140	1.0	本発明例
13	1	15	15	—	—	140	1.0	本発明例
14	1	15	15	—	—	140	1.0	本発明例
15	1	15	15	—	—	140	1.0	本発明例
16	1	15	15	—	—	140	1.0	本発明例
17	1	15	15	—	—	140	1.0	本発明例
18	1	15	15	—	—	140	1.0	本発明例

[0139]

[Table 12]

表 1 2

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加工 性	
9	○	◎	◎	◎	—	本発明例
10	○	◎	◎	◎	—	本発明例
11	○	◎	◎	◎	—	本発明例
12	○	◎	◎	◎	—	本発明例
13	○	◎	◎	◎	—	本発明例
14	○	◎	◎	◎	—	本発明例
15	○	◎	◎	◎	—	本発明例
16	○	◎	◎	◎	—	本発明例
17	○	◎	◎	◎	—	本発明例
18	○	◎	◎	◎	—	本発明例

[0140]

[Table 13]

表 13

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜組成物	乾燥温度 (℃)	膜厚 (μm)	皮膜付着量				皮膜成分のモル比		
					合 計付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ) *3	(γ)/(β) *3	
*1	*2	(℃)	(μm)	(mg/m ²)	(mg/m ²)	(mg/m ²)	(mg/m ²)	*3	*3		
19	1	12	140	0.3	358	160	174	24	3.0	0.5	本発明例
20	1	13	140	0.3	355	160	174	21	3.0	0.5	本発明例
21	1	14	140	0.3	362	—	283	79	—	0.5	比較例
22	1	15	140	0.3	360	—	316	44	—	0.5	比較例
23	1	16	140	0.3	355	—	316	39	—	0.5	比較例
24	1	17	140	0.3	358	334	24	—	—	—	比較例
25	1	18	140	0.3	353	270	—	83	3.0	—	比較例
26	1	19	140	0.3	357	310	—	47	3.0	—	比較例
27	1	20	140	0.3	363	320	—	43	3.0	—	比較例
28	1	21	140	0.3	360	—	—	—	—	—	比較例

[0141]

[Table 14]

表 14

No.	第二層皮膜							区 分
	樹 脂 組成物	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度 (℃)	膜厚 (μm)	
		種類 *4	配合量 *5	種類 *6	配合量 *7			
19	1	15	15	—	—	140	1.0	本発明例
20	1	15	15	—	—	140	1.0	本発明例
21	1	15	15	—	—	140	1.0	比較例
22	1	15	15	—	—	140	1.0	比較例
23	1	15	15	—	—	140	1.0	比較例
24	1	15	15	—	—	140	1.0	比較例
25	1	15	15	—	—	140	1.0	比較例
26	1	15	15	—	—	140	1.0	比較例
27	1	15	15	—	—	140	1.0	比較例
28	1	15	15	—	—	140	1.0	比較例

[0142]

[Table 15]

表 16

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
19	○	○+	○+	◎	—	本発明例
20	○	○	○	○	—	本発明例
21	○	△	△	△	—	比較例
22	○	△	△	△	—	比較例
23	○	△	△	△	—	比較例
24	○	△	△	○	—	比較例
25	○	△	×	○	—	比較例
26	○	△	×	○	—	比較例
27	○	△	×	○	—	比較例
28	○	△	×	△	—	比較例

[0143]

[Table 16]

表 16

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜組成物	乾燥温度 (℃)	膜厚 (μm)	皮膜付着量				皮膜成分のモル比		
					合 計 付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ)	(γ)/(β)	
									*3	*3	
29	1	1	140	0.3	359	150	163	46	3.0	0.5	比較例
30	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
31	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
32	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
33	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
34	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
35	1	1	140	0.3	359	150	163	46	3.0	0.5	比較例
36	2	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
37	3	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
38	4	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
39	5	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
40	6	1	140	0.3	359	150	163	46	3.0	0.5	本発明例

[0144]

[Table 17]

表 17

No.	第二層皮膜						膜厚 (μm)	区 分
	樹 脂 組成物 *4	防錆添加成分 (B)		固形潤滑剤 (C)		乾燥 温度 (℃)		
		種類 *5	配合量 *7	種類 *6	配合量 *7			
29	1	—	—	—	—	140	1.0	比較例
30	1	15	1	—	—	140	1.0	本發明例
31	1	15	5	—	—	140	1.0	本發明例
32	1	15	25	—	—	140	1.0	本發明例
33	1	15	50	—	—	140	1.0	本發明例
34	1	15	100	—	—	140	1.0	本發明例
35	1	15	150	—	—	140	1.0	比較例
36	1	15	15	—	—	140	1.0	本發明例
37	1	15	15	—	—	140	1.0	本發明例
38	1	15	15	—	—	140	1.0	本發明例
39	1	15	15	—	—	140	1.0	本發明例
40	1	15	15	—	—	140	1.0	本發明例

[0145]

[Table 18]

表 18

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
29	○	△	△	◎	—	比較例
30	○	○	○	◎	—	本発明例
31	○	○+	○+	◎	—	本発明例
32	○	◎	◎	◎	—	本発明例
33	○	◎	◎	◎	—	本発明例
34	○	○	○	◎	—	本発明例
35	○	△	△	◎	—	比較例
36	○	◎	◎	◎	—	本発明例
37	○	◎	◎	◎	—	本発明例
38	○	◎	◎	◎	—	本発明例
39	○	◎	◎	◎	—	本発明例
40	○	◎	◎	◎	—	本発明例

[0146]

[Table 19]

表 19

No.	め つ き 鋼 板	第一層皮膜									区 分
		皮 膜 組成物	乾燥 温度 (℃)	膜厚 (μm)	皮膜付着量				皮膜成分のモル比		
					合 計 付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ) *3	(γ)/(β) *3	
*1	*2	(℃)	(μm)	(mg/m ²)	(mg/m ²)	(mg/m ²)	(mg/m ²)	*3	*3		
41	1	1	140	0.3	359	150	163	46	3.0	0.5	比較例
42	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
43	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
44	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
45	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
46	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
47	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
48	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
49	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
50	1	1	140	0.3	359	150	163	46	3.0	0.5	比較例

[0147]

[Table 20]

表 20

No.	第二層皮膜						区 分	
	樹 脂 組成物	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度		膜厚
		種類 *4	配合量 *5	種類 *6	配合量 *7			
						(℃)	(μm)	
41	1	15	15	—	—	140	0.001	比較例
42	1	15	15	—	—	140	0.1	本発明例
43	1	15	15	—	—	140	0.5	本発明例
44	1	15	15	—	—	140	0.7	本発明例
45	1	15	15	—	—	140	2.0	本発明例
46	1	15	15	—	—	140	2.5	本発明例
47	1	15	15	—	—	140	3.0	本発明例
48	1	15	15	—	—	140	4.0	本発明例
49	1	15	15	—	—	140	5.0	本発明例
50	1	15	15	—	—	140	20.0	比較例

[0148]

[Table 21]

表 2 1

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
41	○	×	×	△	—	比較例
42	○	○—	○—	◎	—	本発明例
43	○	○	○	◎	—	本発明例
44	○	○+	○+	◎	—	本発明例
45	○	◎	◎	◎	—	本発明例
46	○	◎	◎	◎	—	本発明例
47	○	◎	◎	◎	—	本発明例
48	○	◎	◎	◎	—	本発明例
49	○	◎	◎	◎	—	本発明例
50	○	◎	◎	◎	—	比較例 ※ 1

※ 1 溶接不可能

[0149]

[Table 22]

表 2 2

No.	め つ き 鋼 板	第一層皮膜									区 分
		皮 膜 組成物	乾燥 温度 (℃)	膜厚 (μm)	皮膜付着量				皮膜成分のモル比		
					合 計 付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ)	(γ)/(β)	
									*3	*3	
51	1	1	140	0.3	359	150	163	46	3.0	0.5	比較例
52	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
53	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
54	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
55	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
56	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
57	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
58	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
59	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
60	1	1	140	0.3	359	150	163	46	3.0	0.5	比較例

[0150]

[Table 23]

表 2 3

No.	第二層皮膜						区 分	
	樹 脂 組成物	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度		膜厚
		種類 *4	配合量 *5	種類 *6	配合量 *7			
51	1	15	15	—	—	40	1.0	比較例
52	1	15	15	—	—	50	1.0	本発明例
53	1	15	15	—	—	80	1.0	本発明例
54	1	15	15	—	—	120	1.0	本発明例
55	1	15	15	—	—	180	1.0	本発明例
56	1	15	15	—	—	200	1.0	本発明例
57	1	15	15	—	—	230	1.0	本発明例
58	1	15	15	—	—	250	1.0	本発明例
59	1	15	15	—	—	350	1.0	本発明例
60	1	15	15	—	—	380	1.0	比較例

[0151]

[Table 24]

表 2 4

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
51	○	×	×	×	—	比較例
52	○	○—	○—	○	—	本発明例
53	○	○	○—	○+	—	本発明例
54	○	◎	○	◎	—	本発明例
55	○	◎	◎	◎	—	本発明例
56	○	◎	◎	◎	—	本発明例
57	○	◎	◎	◎	—	本発明例
58	○	◎	◎	◎	—	本発明例
59	○	◎	◎	◎	—	本発明例
60	○	△	△	◎	—	比較例

[0152]

[Table 25]

表 2 5

No.	め つき 鋼 板	第一層皮膜									区 分
		皮 膜 組成物	乾燥 温度 (℃)	膜厚 (μ m)	皮膜付着量 *3				皮膜成分のモル比		
					合 計 付着量 (mg/m^2)	成分(α) (mg/m^2)	成分(β) (mg/m^2)	成分(γ) (mg/m^2)	(α)/(γ)	(γ)/(β)	
									*3	*3	
61	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
62	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
63	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
64	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
65	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
66	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
67	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
68	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
69	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
70	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
71	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
72	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
73	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
74	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例

[0153]

[Table 26]

表 2 6

No.	第二層皮膜							区 分
	樹 脂 組成物	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度 (℃)	膜厚 (μm)	
		種類 *4	配合量 *5	種類 *6	配合量 *7			
61	1	1	15	—	—	140	1.0	本發明例
62	1	2	15	—	—	140	1.0	本發明例
63	1	3	15	—	—	140	1.0	本發明例
64	1	4	15	—	—	140	1.0	本發明例
65	1	5	15	—	—	140	1.0	本發明例
66	1	6	15	—	—	140	1.0	本發明例
67	1	7	15	—	—	140	1.0	本發明例
68	1	8	15	—	—	140	1.0	本發明例
69	1	9	15	—	—	140	1.0	本發明例
70	1	10	15	—	—	140	1.0	本發明例
71	1	11	15	—	—	140	1.0	本發明例
72	1	12	15	—	—	140	1.0	本發明例
73	1	13	15	—	—	140	1.0	本發明例
74	1	14	15	—	—	140	1.0	本發明例

[0154]

[Table 27]

表 27

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
61	○	○	○	◎	—	本発明例
62	○	○	○	◎	—	本発明例
63	○	○	○	◎	—	本発明例
64	○	○	○	◎	—	本発明例
65	○	○	○	◎	—	本発明例
66	○	○	○	◎	—	本発明例
67	○	○	○	◎	—	本発明例
68	○	○	○	◎	—	本発明例
69	○	○	○	◎	—	本発明例
70	○	○	○	◎	—	本発明例
71	○	○	○	◎	—	本発明例
72	○	○+	○+	◎	—	本発明例
73	○	○+	○+	◎	—	本発明例
74	○	○+	○+	◎	—	本発明例

[0155]

[Table 28]

表 28

No.	め つ き 鋼 板	第一層皮膜									区 分
		皮 膜 組成物	乾燥 温度 (°C)	膜厚 (μm)	皮膜付着量				皮膜成分のモル比		
					合 計 付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ)	(γ)/(β)	
									*3	*3	
75	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
76	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
77	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
78	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
79	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
80	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
81a	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
81b	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
81c	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
81d	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
81e	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
81f	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
81g	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
82	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例

[0156]

[Table 29]

表 29

No.	第二層皮膜							區 分
	樹 脂 組 成 物	防鏽添加成分(B)		固形潤滑劑(C)		乾燥 溫度	膜厚	
		種類 *4	配合量 *5	種類 *6	配合量 *7			
75	1	16	15	—	—	140	1.0	本發明例
76	1	17	15	—	—	140	1.0	本發明例
77	1	18	15	—	—	140	1.0	本發明例
78	1	19	15	—	—	140	1.0	本發明例
79	1	20	15	—	—	140	1.0	本發明例
80	1	21	15	—	—	140	1.0	本發明例
81a	1	1	15	1	10	140	1.0	本發明例
81b	1	5	15	1	10	140	1.0	本發明例
81c	1	7	15	1	10	140	1.0	本發明例
81d	1	12	15	1	10	140	1.0	本發明例
81e	1	13	15	1	10	140	1.0	本發明例
81f	1	14	15	1	10	140	1.0	本發明例
81g	1	15	15	1	10	140	1.0	本發明例
82	1	15	15	2	10	140	1.0	本發明例

[0157]

[Table 30]

表 30

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
75	○	○+	○+	◎	—	本発明例
76	○	○+	○+	◎	—	本発明例
77	○	○+	○+	◎	—	本発明例
78	○	○+	○+	◎	—	本発明例
79	○	◎	◎	◎	—	本発明例
80	○	◎	◎	◎	—	本発明例
81a	○	○	○	◎	◎	本発明例
81b	○	○	○	◎	◎	本発明例
81c	○	○	○	◎	◎	本発明例
81d	○	○+	○+	◎	◎	本発明例
81e	○	○+	○+	◎	◎	本発明例
81f	○	○+	○+	◎	◎	本発明例
81g	○	◎	◎	◎	◎	本発明例
82	○	◎	◎	◎	◎	本発明例

[0158]

[Table 31]

表 31

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜 組 成 物	乾燥 温度 (℃)	膜厚 (μ m)	皮膜付着量				皮膜成分のモル比		
					合 計 付 着 量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)／(γ)	(γ)／(β)	
*1	*2	(℃)	(μ m)	(mg/m ²)	(mg/m ²)	(mg/m ²)	(mg/m ²)	*3	*3		
83	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
84	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
85	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
86	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
87	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
88	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
89	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
90	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
91	1	1	140	0.3	359	150	163	46	3.0	0.5	比較例

[0159]

[Table 32]

表 3 2

No.	樹脂組成物 *4	第二層皮膜					膜厚 (μm)	区 分
		防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度 (℃)		
		種類 *5	配合量 *7	種類 *6	配合量 *7			
83	1	15	15	3	10	140	1.0	本發明例
84	1	15	15	4	10	140	1.0	本發明例
85	1	15	15	5	10	140	1.0	本發明例
86	1	15	15	6	10	140	1.0	本發明例
87	1	15	15	1	1	140	1.0	本發明例
88	1	15	15	1	3	140	1.0	本發明例
89	1	15	15	1	40	140	1.0	本發明例
90	1	15	15	1	80	140	1.0	本發明例
91	1	15	15	1	100	140	1.0	比較例

[0160]

[Table 33]

表 3 3

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
83	○	◎	◎	◎	◎	本発明例
84	○	◎	◎	◎	◎	本発明例
85	○	◎	◎	◎	◎	本発明例
86	○	◎	◎	○	◎	本発明例
87	○	◎	◎	◎	○	本発明例
88	○	◎	◎	◎	◎	本発明例
89	○	◎	◎	◎	◎	本発明例
90	○	◎	◎	○	◎	本発明例
91	○	◎	◎	×	◎	比較例

[0161]

[Table 34]

表 3 4

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜組成物	乾燥温度	膜厚	皮膜付着量				皮膜成分のモル比		
					合 計 付着量	成分(α)	成分(β)	成分(γ)	(α)/(γ)	(γ)/(β)	
	*1	*2	(°C)	(μ m)	(mg/m ²)	(mg/m ²)	(mg/m ²)	(mg/m ²)	*3	*3	
92	1	1	140	0.001	1.2	0.5	0.5	0.2	3.0	0.5	比較例
93	1	1	140	0.005	6	2.5	2.5	1	3.0	0.5	本発明例
94	1	1	140	0.01	12	5	5	2	3.0	0.5	本発明例
95	1	1	140	0.1	120	51	54	15	3.0	0.5	本発明例
96	1	1	140	0.5	599	250	272	77	3.0	0.5	本発明例
97	1	1	140	1.0	1197	500	544	153	3.0	0.5	本発明例
98	1	1	140	2	2395	1000	1089	306	3.0	0.5	本発明例
99	1	1	140	3	3591	1500	1633	458	3.0	0.5	本発明例
100	1	1	140	5	5986	2500	2722	764	3.0	0.5	比較例

[0162]

[Table 35]

表 3 5

No.	第二層皮膜						区 分	
	樹 脂 組成物	防錆添加成分 (B)		固形潤滑剤 (C)		乾燥 温度		膜厚
		種類 *4	配合量 *5	種類 *6	配合量 *7			
92	1	15	15	—	—	140	1.0	比較例
93	1	15	15	—	—	140	1.0	本發明例
94	1	15	15	—	—	140	1.0	本發明例
95	1	15	15	—	—	140	1.0	本發明例
96	1	15	15	—	—	140	1.0	本發明例
97	1	15	15	—	—	140	1.0	本發明例
98	1	15	15	—	—	140	1.0	本發明例
99	1	15	15	—	—	140	1.0	本發明例
100	1	15	15	—	—	140	1.0	比較例

[0163]

[Table 36]

表 3 6

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
92	○	×	×	◎	—	比較例
93	○	○—	○—	◎	—	本発明例
94	○	○	○	◎	—	本発明例
95	○	○+	○+	◎	—	本発明例
96	○	◎	◎	◎	—	本発明例
97	○	◎	◎	◎	—	本発明例
98	○	◎	◎	◎	—	本発明例
99	○	◎	◎	◎	—	本発明例
100	○	◎	◎	◎	—	比較例 ※ 1

※ 1 溶接が不可能

[0164]

[Table 37]

表 3 7

No.	めつき鋼板 *1	第一層皮膜									区 分
		皮 膜 組 成 物 *2	乾 燥 温 度 (℃)	膜 厚 (μ m)	皮膜付着量 *3				皮膜成分のモル比		
					合 計 付 着 量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ) *3	(γ)/(β) *3	
101	1	1	30	0.3	359	150	163	46	3.0	0.5	比較例
102	1	1	50	0.3	359	150	163	46	3.0	0.5	本発明例
103	1	1	80	0.3	359	150	163	46	3.0	0.5	本発明例
104	1	1	120	0.3	359	150	163	46	3.0	0.5	本発明例
105	1	1	180	0.3	359	150	163	46	3.0	0.5	本発明例
106	1	1	200	0.3	359	150	163	46	3.0	0.5	本発明例
107	1	1	300	0.3	359	150	163	46	3.0	0.5	本発明例
108	1	1	350	0.3	359	150	163	46	3.0	0.5	比較例

[0165]

[Table 38]

表 3 8

No.	第二層皮膜							区 分
	樹 脂 組成物 *4	防錆添加成分 (B)		固形潤滑剤 (C)		乾燥 膜厚 温度 (℃)	膜厚 (μ m)	
		種類 *5	配合量 *7	種類 *6	配合量 *7			
101	1	15	15	—	—	140	1.0	比較例
102	1	15	15	—	—	140	1.0	本発明例
103	1	15	15	—	—	140	1.0	本発明例
104	1	15	15	—	—	140	1.0	本発明例
105	1	15	15	—	—	140	1.0	本発明例
106	1	15	15	—	—	140	1.0	本発明例
107	1	15	15	—	—	140	1.0	本発明例
108	1	15	15	—	—	140	1.0	比較例

[0166]

[Table 39]

表 3 9

No.	性 能					区 分
	外観	耐白錆性 CCT 50 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 50 サイクル後	塗 装 密着性	加 工 性	
101	○	×	×	×	—	比較例
102	○	○—	○—	○	—	本発明例
103	○	◎	◎	◎	—	本発明例
104	○	◎	◎	◎	—	本発明例
105	○	◎	◎	◎	—	本発明例
106	○	◎	◎	◎	—	本発明例
107	○	◎	◎	◎	—	本発明例
108	○	×	×	◎	—	比較例

[0167] In order to obtain [example 2] household electric appliances, building materials, and the organic covering steel plate for autoparts, Board thickness : The plating steel plate shown in Table 1 which performed various zinc system plating or aluminum system plating to cold rolled sheet steel (0.8mm and surface roughness Ra:1.0micrometer) is used as a processing negative. After alkaline-degreasing-processing and rinsing drying the front face of this plating steel plate, stoving of the processing liquid (coat constituent) shown in Table 2 and 3 was applied and carried out by the roll coater, and the 1st layer coat was made to form. The solid content (heating residue) or the spreading conditions of processing liquid (rolling force of a roll, rotational speed, etc.) adjusted the coating weight of this 1st layer coat. Subsequently, applied the coating constituent shown in Table 4 by the roll coater, it carried out stoving, the 2nd layer coat was made to form, and the organic covering steel plate of the example of this invention and the example of a comparison was manufactured. The solid content (heating residue) or the spreading conditions of a coating constituent (rolling force of a roll, rotational speed, etc.) adjusted the coating weight of the 2nd layer coat.

[0168] About the obtained organic covering steel plate, the quality engine performance (a coat

appearance, white-rust-proof, the white-rust-proof after alkaline degreasing, coating adhesion, workability, spot welding nature, conductivity) was evaluated. The result is shown in Table 40 - 57 with the coat configuration of the 1st layer coat and the 2nd layer coat etc. Evaluation of the spot welding nature of an organic covering steel plate and conductivity was performed by [as being the following], and made evaluation of other engine performance be the same as that of [an example 1].

[0169] (6) Using the test piece of 1.2mm of spot welding nature board thickness, under an upper electrode CR mold (16mm of diameters of former, 5.4mm of diameters of a tip), a bottom electrode female mold (16mm of diameters of a tip), the welding pressure of 300kg, and the conditions of the 13 cycle (60Hz) resistance welding time, the continuation RBI trial of spot welding nature was performed, the case where the diameter of a nugget became smaller than 4.4mm was made into the limitation of a welding RBI, and the following estimated.

O 1000 or more 3000 or more :RBI [continuation] O:continuation RBIs, 500 or more less than 3000 point **:continuation RBIs, below 1000 point x : less than 500 continuation RBIs [0170] (7)

Conductivity (surface-electrical-resistance value)

Using 4 probe resistivity meter ("RORESUTA AP" by Mitsubishi Chemical), the surface electrical resistance of a test piece was measured and the following estimated.

O 10 - 4 or less ohm [of :surface-electrical-resistance values] O:surface-electrical-resistance value 10-4ohm **, 10 - 3 or less ohm **:surface-electrical-resistance value 10-3ohm **, and less than [102ohm] x : surface-electrical-resistance value ** of 102ohms [0171] In following Table 40 - 57, *1-*7 indicated to front Naka show the following contents.

*1: The plating steel plate No given in Table 1

*2: The constituent No for the 1st layer coats given in Table 2 and 3

*3: A component (beta) is the coating weight of 2OP5 conversion, and a component (gamma) is the resin constituent No for the 2nd layer coats given in the coating weight *4:table 4 of the amount conversion of metals of Mg, Mn, and aluminum.

*5: The rust-proofing addition component No given in Table 5

*6: Solid lubricant No given in Table 6

*7: Loadings to the solid content 100 weight section of a resin constituent (weight section)

[0172]

[Table 40]

表 40

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜 組成物	乾燥 温度	膜厚	皮膜付着量				皮膜成分のモル比		
					合 計 付着量	成分(α)	成分(β)	成分(γ)	(α)/(γ)	(γ)/(β)	
									(mg/m ²)	(mg/m ²)	
*1	*2	(℃)	(μm)								
1	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
2	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
3	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
4	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
5	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
6	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
7	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
8	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例

[0173]

[Table 41]

表 4 1

No.	第二層皮膜						区 分	
	樹 脂 組成物	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度 (℃)		付着量 (g/m ²)
		種類 *4	配合量 *5	種類 *6	配合量 *7			
1	1	15	15	—	—	140	0.3	本発明例
2	2	15	15	—	—	140	0.3	本発明例
3	3	15	15	—	—	140	0.3	本発明例
4	4	15	15	—	—	140	0.3	本発明例
5	5	15	15	—	—	140	0.3	本発明例
6	6	15	15	—	—	140	0.3	本発明例
7	7	15	15	—	—	140	0.3	本発明例
8	8	15	15	—	—	140	0.3	本発明例

[0174]

[Table 42]

表 4 2

No.	性 能							区 分
	外観	耐白錆性 CCT 20 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 20 サイクル後	塗 装 密着性	溶 接 性	導 電 性	加 工 性	
1	○	◎	◎	◎	◎	◎	—	本発明例
2	○	◎	◎	◎	◎	◎	—	本発明例
3	○	○+	○	◎	◎	◎	—	本発明例
4	○	○+	○	◎	◎	◎	—	本発明例
5	○	○	○-	◎	◎	◎	—	本発明例
6	○	○	○-	◎	◎	◎	—	本発明例
7	○	○	○-	◎	◎	◎	—	本発明例
8	○	○	○-	◎	◎	◎	—	本発明例

[0175]

[Table 43]

表 4 3

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜組成物	乾燥温度 (℃)	膜厚 (μ m)	皮膜付着量				皮膜成分のモル比		
					合 計付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ)	(γ)/(β)	
									*3	*3	
9	1	2	140	0.3	344	30	245	69	0.4	0.5	本発明例
10	1	3	140	0.3	363	90	245	28	3.0	0.2	本発明例
11	1	4	140	0.3	360	200	99	61	3.0	1.1	本発明例
12	1	5	140	0.3	358	290	53	15	18.0	0.5	本発明例
13	1	6	140	0.3	600	150	163	46	3.0	0.5	本発明例
14	1	7	140	0.3	358	160	174	24	3.0	0.5	本発明例
15	1	8	140	0.3	360	35	286	39	0.4	0.5	本発明例
16	1	9	140	0.3	349	90	245	14	3.0	0.2	本発明例
17	1	10	140	0.3	362	220	109	33	3.0	1.1	本発明例
18	1	11	140	0.3	362	300	54	8	18.0	0.5	本発明例
19	1	12	140	0.3	358	160	174	24	3.0	0.5	本発明例
20	1	13	140	0.3	355	160	174	21	3.0	0.5	本発明例

[0176]

[Table 44]

表 4 4

No.	第二層皮膜						区 分	
	樹 脂 組成物	防錆添加成分 (B)		固形潤滑剤 (C)		乾燥 溫度 (℃)		付着量 (g/m ²)
		種類 *4	配合量 *5	種類 *6	配合量 *7			
9	1	15	15	—	—	140	0.3	本發明例
10	1	15	15	—	—	140	0.3	本發明例
11	1	15	15	—	—	140	0.3	本發明例
12	1	15	15	—	—	140	0.3	本發明例
13	1	15	15	—	—	140	0.3	本發明例
14	1	15	15	—	—	140	0.3	本發明例
15	1	15	15	—	—	140	0.3	本發明例
16	1	15	15	—	—	140	0.3	本發明例
17	1	15	15	—	—	140	0.3	本發明例
18	1	15	15	—	—	140	0.3	本發明例
19	1	15	15	—	—	140	0.3	本發明例
20	1	15	15	—	—	140	0.3	本發明例

[0177]

[Table 45]

表 4 5

No.	性 能							区 分
	外観	耐白錆性 CCT 20 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 20 サイクル後	塗 装 密着性	溶 接 性	導 電 性	加 工 性	
9	○	◎	◎	◎	◎	◎	—	本発明例
10	○	◎	◎	◎	◎	◎	—	本発明例
11	○	◎	◎	◎	◎	◎	—	本発明例
12	○	◎	◎	◎	◎	◎	—	本発明例
13	○	◎	◎	◎	◎	◎	—	本発明例
14	○	◎	◎	◎	◎	◎	—	本発明例
15	○	◎	◎	◎	◎	◎	—	本発明例
16	○	◎	◎	◎	◎	◎	—	本発明例
17	○	◎	◎	◎	◎	◎	—	本発明例
18	○	◎	◎	◎	◎	◎	—	本発明例
19	○	○+	○+	◎	◎	◎	—	本発明例
20	○	○	○	○	◎	◎	—	本発明例

[0178]

[Table 46]

表 4 6

No.	め づ き 鋼 板	第一層皮膜									区 分
		皮 膜 組成物	乾燥 温度	膜厚 (μ m)	皮膜付着量				皮膜成分のモル比		
					合 計 付着量 (mg/m^2)	成分(α) (mg/m^2)	成分(β) (mg/m^2)	成分(γ) (mg/m^2)	(α)/(γ) *3	(γ)/(β) *3	
21	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
22	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
23	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
24	1	1	140	0.3	359	150	163	46	3.0	0.5	比較例
25	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
26	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
27	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
28	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
29	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
30	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
31	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例

[0179]

[Table 47]

表 4 7

No.	第二層皮膜						区 分	
	樹 脂 組成物 *4	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度 (℃)		付着量 (g/m ²)
		種類 *5	配合量 *7	種類 *6	配合量 *7			
21	1	15	5	—	—	140	0.3	本發明例
22	1	15	25	—	—	140	0.3	本發明例
23	1	15	50	—	—	140	0.3	本發明例
24	1	15	15	—	—	140	0.01	比較例
25	1	15	15	—	—	140	0.1	本發明例
26	1	15	15	—	—	140	0.15	本發明例
27	1	15	15	—	—	140	0.2	本發明例
28	1	15	15	—	—	140	0.3	本發明例
29	1	15	15	—	—	140	0.4	本發明例
30	1	15	15	—	—	140	0.49	本發明例
31	1	15	15	—	—	140	0.5	本發明例

[0180]

[Table 48]

表 4 8

No.	性 能							区 分
	外観	耐白錆性 CCT	アルカリ脱脂 後の耐白錆性 CCT	塗 装 密着性	溶 接性	導 電性	加 工性	
		20 サイクル後	20 サイクル後					
21	○	○+	○+	◎	◎	◎	—	本発明例
22	○	◎	◎	◎	◎	◎	—	本発明例
23	○	◎	◎	◎	◎	◎	—	本発明例
24	○	×	×	△	◎	◎	—	比較例
25	○	○	○	◎	◎	◎	—	本発明例
26	○	◎	◎	◎	◎	◎	—	本発明例
27	○	◎	◎	◎	◎	◎	—	本発明例
28	○	◎	◎	◎	◎	◎	—	本発明例
29	○	◎	◎	◎	◎	◎	—	本発明例
30	○	◎	◎	◎	◎	◎	—	本発明例
31	○	◎	◎	◎	△	△	—	本発明例

[0181]

[Table 49]

表 49

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜 組成物	乾燥温度 (℃)	膜厚 (μm)	皮膜付着量 *3				皮膜成分のモル比		
					合 計 付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ)	(γ)/(β)	
									*3	*3	
32	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
33	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
34	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
35	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
36	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
37	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
38	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
39	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
40	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
41	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
42	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
43	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
44	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
45	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例

[0182]

[Table 50]

表 50

No.	第二層皮膜							区 分
	樹 脂 組 成 物	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度 (℃)	付着量 (g/m ²)	
		種類 *4	配合量 *5	種類 *6	配合量 *7			
32	1	1	15	—	—	140	0.3	本発明例
33	1	2	15	—	—	140	0.3	本発明例
34	1	3	15	—	—	140	0.3	本発明例
35	1	4	15	—	—	140	0.3	本発明例
36	1	5	15	—	—	140	0.3	本発明例
37	1	6	15	—	—	140	0.3	本発明例
38	1	7	15	—	—	140	0.3	本発明例
39	1	8	15	—	—	140	0.3	本発明例
40	1	9	15	—	—	140	0.3	本発明例
41	1	10	15	—	—	140	0.3	本発明例
42	1	11	15	—	—	140	0.3	本発明例
43	1	12	15	—	—	140	0.3	本発明例
44	1	13	15	—	—	140	0.3	本発明例
45	1	14	15	—	—	140	0.3	本発明例

[0183]

[Table 51]

表 5 1

No.	性 能							区 分
	外観	耐白錆性 CCT 20 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 20 サイクル後	塗 装 密着性	溶 接 性	導 電 性	加 工 性	
32	○	○	○	◎	◎	◎	—	本発明例
33	○	○	○	◎	◎	◎	—	本発明例
34	○	○	○	◎	◎	◎	—	本発明例
35	○	○	○	◎	◎	◎	—	本発明例
36	○	○	○	◎	◎	◎	—	本発明例
37	○	○	○	◎	◎	◎	—	本発明例
38	○	○	○	◎	◎	◎	—	本発明例
39	○	○	○	◎	◎	◎	—	本発明例
40	○	○	○	◎	◎	◎	—	本発明例
41	○	○	○	◎	◎	◎	—	本発明例
42	○	○	○	◎	◎	◎	—	本発明例
43	○	○+	○+	◎	◎	◎	—	本発明例
44	○	○+	○+	◎	◎	◎	—	本発明例
45	○	○+	○+	◎	◎	◎	—	本発明例

[0184]

[Table 52]

表 5 2

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜組成物	乾燥温度 (℃)	膜厚 (μ a)	皮膜付着量				皮膜成分のモル比		
					合 計 付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ)	(γ)/(β)	
									*3	*3	
46	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
47	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
48	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
49	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
50	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
51	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
52	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例
53	1	1	140	0.3	359	150	163	46	3.0	0.5	本発明例

[0185]

[Table 53]

表 5 3

No.	第二層皮膜						区 分	
	樹 脂 組成物	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度 (℃)		付着量 (g/m ²)
		種類 *4	配合量 *7	種類 *6	配合量 *7			
46	1	16	15	—	—	140	0.3	本発明例
47	1	17	15	—	—	140	0.3	本発明例
48	1	18	15	—	—	140	0.3	本発明例
49	1	19	15	—	—	140	0.3	本発明例
50	1	20	15	—	—	140	0.3	本発明例
51	1	21	15	—	—	140	0.3	本発明例
52	1	15	15	1	3	140	0.3	本発明例
53	1	15	15	1	40	140	0.3	本発明例

[0186]

[Table 54]

表 5 4

No.	性 能							区 分
	外観	耐白錆性 CCT 20 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 20 サイクル後	塗 装 密着性	溶 接性	導 電性	加 工性	
46	○	○+	○+	◎	◎	◎	—	本発明例
47	○	○+	○+	◎	◎	◎	—	本発明例
48	○	○+	○+	◎	◎	◎	—	本発明例
49	○	○+	○+	◎	◎	◎	—	本発明例
50	○	◎	◎	◎	◎	◎	—	本発明例
51	○	◎	◎	◎	◎	◎	—	本発明例
52	○	◎	◎	◎	◎	◎	◎	本発明例
53	○	◎	◎	◎	◎	◎	◎	本発明例

[0187]

[Table 55]

表 5 5

No.	めつき鋼板	第一層皮膜									区 分
		皮 膜組成物	乾燥温度 (℃)	膜厚 (μ m)	皮膜付着量				皮膜成分のモル比		
					合 計付着量 (mg/m ²)	成分(α) (mg/m ²)	成分(β) (mg/m ²)	成分(γ) (mg/m ²)	(α)/(γ)	(γ)/(β)	
									*3	*3	
54	1	1	140	0.001	1.2	0.5	0.5	0.2	3.0	0.5	比較例
55	1	1	140	0.005	6	2.5	2.5	1	3.0	0.5	本発明例
56	1	1	140	0.01	12	5	5	2	3.0	0.5	本発明例
57	1	1	140	0.1	120	51	54	15	3.0	0.5	本発明例
58	1	1	140	0.5	599	250	272	77	3.0	0.5	本発明例
59	1	1	140	1.0	1197	500	544	153	3.0	0.5	本発明例

[0188]

[Table 56]

表 5 6

No.	第二層皮膜						区 分	
	樹 脂 組成物	防錆添加成分(B)		固形潤滑剤(C)		乾燥 温度 (℃)		付着量 (g/m ²)
		種類 *4	配合量 *7	種類 *6	配合量 *7			
54	1	15	15	—	—	140	0.3	比較例
55	1	15	15	—	—	140	0.3	本発明例
56	1	15	15	—	—	140	0.3	本発明例
57	1	15	15	—	—	140	0.3	本発明例
58	1	15	15	—	—	140	0.3	本発明例
59	1	15	15	—	—	140	0.3	本発明例

[0189]

[Table 57]

表 5 7

No.	性 能							区 分
	外観	耐白錆性 CCT 20 サイクル後	アルカリ脱脂 後の耐白錆性 CCT 20 サイクル後	塗 装 密着性	溶 接性	導 電性	加 工性	
54	○	×	×	◎	◎	◎	—	比較例
55	○	○—	○—	◎	◎	◎	—	本発明例
56	○	○	○	◎	◎	◎	—	本発明例
57	○	○+	○+	◎	◎	◎	—	本発明例
58	○	◎	◎	◎	◎	◎	—	本発明例
59	○	◎	◎	◎	△	△	—	本発明例

[0190]

[Effect of the Invention] As stated above, moreover, the organic covering steel plate of this invention has corrosion resistance advanced as an organic covering steel plate of the application of building

materials, household electric appliances, an automobile, etc. in the coat component of the processing liquid at the time of manufacture, or a product, excluding hexavalent chromium at all, and is excellent in a coat appearance, coating adhesion, etc. Moreover, the organic covering steel plate which has the outstanding corrosion resistance suitable as materials, such as OA equipment with which advanced spot welding nature is demanded, and an AV equipment, advanced conductivity, and spot welding nature can be obtained from the need of severe conductivity being required from the cure against a noise of a product, and acquiring high productivity in the assembly process of a chassis etc., by regulating the coating weight of the 1st layer coat and the 2nd layer coat in the specific range.

[Translation done.]